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COMMENT(S)

LOCATION MAPS - FIGURES: 1, 3 ,5, 7
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TECHNICAL REPORT
COMMENTS ON SAUGET AREA 1
HRS SCORING

Prepared For:

Cadwalader, Wickersham & Taft
1333 New Hampshire Avenue, NW
Washington, DC

Prepared By:

Menzie-Cura & Associates, Inc.
One Courthouse Lane, Suite Two
Chelmsford, Massachusetts 01824
(508) 453-4300

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Technical Report - Comments on Sauget Area 1 HRS Scoring
September 12, 1996

Introduction

This technical report provides comments on EPA's recent Hazardous Ranking System (HRS) scoring of Sauget Area 1 in St. Clair County, Illinois. The United States Environmental Protection Agency (USEPA) presented this scoring in the HRS Documentation Record and Supporting References (HRS Record). These technical comments address the reasons which USEPA provides for various scoring components in the HRS Record.

The technical comments depend upon our review of the HRS Record and a recent site visit to Sauget Area 1 and Target Areas by Menzie-Cura & Associates, Inc. personnel. The report analyzes the scoring on the basis of its conformance to USEPA's Hazardous Ranking System Guidance Manual (EPA OSWER, 1992a), the regulations in 40 CFR Part 300, and state-of-the-practice site assessment and scientific methods.

Figure 1 shows the general area. A portion of the current Sauget Area 1 (Sources 1, 2, 4, 5, 6 and 7 only, and referred to as the 1988 version of Sauget Area I in this report) along with another area referred to as Sauget Area 2 were subject to an Expanded Site Investigation completed in 1988 (Ref. 3a). Figure 2 depicts these two areas. Additional sampling was performed following this 1988 study, leading to HRS scoring of an enlarged Sauget Area 1, but not Sauget Area 2. Figure 3 shows the location of the nine sources within Sauget Area 1 that USEPA scored in the HRS Record along with the surface water "release" and "background" sediment sampling locations.

As indicated below, our review found that USEPA's HRS scoring was inappropriately applied in several areas. In particular, USEPA failed to demonstrate a release to air, incorrectly aggregated the various sources to form Sauget Area 1, used inaccurate data in their analyses, and failed to recognize that Cerro Copper has conducted an extensive removal action at Source 1. Note that:

> The USEPA failed to follow their own guidance in using invalid data to establish a release to the air migration pathway, relied on samples which represent subsurface soils that are not exposed to the atmosphere, and depended upon an intrusive condition to establish an air release;

The nine sources identified by USEPA in Sauget Area 1 should not be aggregated into a single site because the sources in Sauget Area 1 are not owned and operated by the same entity, they were subject historically to different waste disposal practices, they represent different source types, and one source is not a source at all;

The USEPA used inaccurate data in attempting to establish a surface water release migration pathway, an air release pathway, a "release" sample, and "background samples";

The USEPA did not consider that Cerro Copper has already conducted an extensive removal action at Source 1 in November 1990, when 27,500 cubic yards of contaminated sediment was excavated before Source 1 was backfilled with clean fill material.

This report includes two sections:

Section 1: Technical Comments; and

Section 2: Re-scoring Based on Technical Comments.

Section 1 has two technical appendices:

Appendix A: Data Usability Review; and

Appendix B: Observations in the Area of Sauget Area 1 and the Target Area.

Our review and observations demonstrate:

USEPA failed to establish an observed release to the surface water migration pathway;

USEPA incorrectly classified two sources as surface impoundments;

USEPA identified an area as a source that does not qualify as a source;

USEPA miscalculated the human target population;

USEPA failed to demonstrate an observed release to the air migration pathway; and

USEPA inappropriately aggregated the nine sources which comprise Sauget Area 1.

Using conservative assumptions, we re-scored Sauget Area 1 based on our review of the HRS Record, recent site-specific observations, published information on local biological conditions, and correct worker population figures. This re-scoring results in a score of 8.92 for the aggregated Sauget Area 1. This revised score is 19.58 points less than the score necessary for inclusion on the National Priorities List (NPL), and 52.93 points less than the score calculated in the HRS Record.

1.0 Technical Comments

We have organized the technical comments according to the order of the scoring elements appearing in the scoring document. Each subsection is named after the scoring element upon which we comment. Where a particular comment applied to more than one scoring component, we included it in both subsections. Within each subsection, we provide a general comment, the specific technical issues supporting the comment, and a point-by-point expansion of each issue.

1.1 Surface Water - Observed Release

The USEPA has not established an observed release to the surface water migration pathway, based on the information provided in the HRS Record. Specifically:

There are serious data quality documentation defects in the sediment data which USEPA provided in the HRS Record to attempt to establish an observed release;

USEPA failed to use their own guidance to evaluate the data quality for the sediment data used to represent "release" and "background" samples in HRS scoring;

It is technically indefensible to use bulk sediment data which is not normalized to the appropriate chemical and physical characteristics of the sediment to demonstrate surface water transport and migration of substances;

The USEPA used an arbitrary representation of the PCB data to establish a gradient from the sources to the release site; and

The EPA's sampling design to establish a release of substances from Sauget Area 1 to the wetland, including their designation of "release" and "background" samples, is flawed and cannot be used to establish an observed release.

1.1.1 Data Quality Defects in the "Release" and "Background" Samples

The HRS Record designated sample X111, in the wetland, as the "release" sample. The designated "background" samples were X112 and X113. The Illinois Environmental Protection Agency (IEPA) analyzed these for organic and inorganic constituents using Contract Laboratory Program (CLP) methods, and reported the chemical results on CLP Form 1 data sheets. The USEPA relied upon these three samples to establish an observed release to surface water originating from Sauget Area 1.

Appendix A provides our detailed data usability review of these samples. This review demonstrates that the USEPA did not follow the requirements in their own guidance documents to evaluate the data quality or use of qualified data in HRS scoring. Furthermore, the HRS Record does not provide complete documentation or information to establish the validity or usability of the data generated from the analysis of the "background" or "release" samples.

Specifically:

The HRS Record does not contain quality assurance documentation or information necessary to validate the data used for establishing an observed release for the surface water migration pathway. The IEPA data presented in HRS Record References 4a and 4b do not contain the laboratory data reports. The absence of supporting laboratory documentation *(e.g.,* chromatograms, extraction logs, quality control report forms, instrument printouts, method and instrument blank results, surrogate recovery results, matrix spike and duplicate results, laboratory control sample results) prevents USEPA from establishing that the PCB and metals data are valid and usable for HRS scoring. The data review and comment in this report and Appendix A are based only upon information provided in HRS Reference 4b (CLP Form 1 documents).

The USEPA did not apply their own data quality guidance, *Guidance for Performing Site Inspections Under CERCLA, USEPA 1992*, to the data generated from the analysis of "background" and "release" samples. The USEPA defines different data use categories (DUC) for screening versus listing HRS sites in this guidance. For listing (or scoring) a site, the USEPA requires the most rigorous data quality levels (DUC-I and DUC-II). The IEPA validated the "background" and "release" sample data and summarized the validation in a letter that never specified the DUC for the data (HRS Record Reference 4b). The failure of the IEPA to specify a DUC demonstrates that they did not use the USEPA *Guidance for Performing Site Inspections Under CERCLA (SI Guidance, USEPA 1992*) to evaluate the data for use in HRS scoring.

Additionally, the SI Guidance requires that qualified results not be used in an HRS scoring, except under particular conditions. The lead results were qualified on the CLP report Form 1s with a "*". The SI Guidance requires that "qualified data may be used only if the bias (unknown, low, high) associated with the data and the reasons for the qualification are known" (USEPA 1992, section 5.2). IEPA failed to describe the reasons for the lead qualification or to detail the magnitude of the quality control problem. Specifically, IEPA did not specify a bias associated with the data or the reasons for the qualification. Furthermore, the SI Guidance states that "some qualified data still may not be appropriate to develop a score for listing," (USEPA 1992).

The USEPA did not apply their own data quality guidance, *Using Qualified Data to Document an Observed Release, USEPA, PB94-96331,* July 1994, to the data generated from the analysis of "background" and "release" samples. The lead result for sample X111 is flagged with the qualifier "*" on the CLP report Form 1. This qualifier means that the duplicate precision did not meet CLP quality criteria. The missing information prevents the determination of magnitude of the imprecision. However, USEPA guidance for use of qualified data in an HRS to establish an observed release (*Using Qualified Data to Document an Observed Release, USEPA, PB94-96331,* July 1994, hereafter Qualified Data Guidance) requires that the lead value be multiplied by a specific factor provided in the Qualified Data Guidance to account for the undetermined bias in this value. The USEPA did not apply this requirement of the guidance to the lead data before using it to establish an observed release in the HRS.

The sample quantitation limit (SQL) for mercury, as reported in the HRS Record, is uncertain. The sample results for mercury for the "release" and "background" samples have extremely low SQLs compared to the SQLs expected for the analytical method used. For the CLP method used for analyzing mercury in these samples, the SQL should not have been below 0.1 mg/Kg but was reported as 60% to 70% lower than this amount. This means that a method other than the CLP method may have been used for mercury analysis or that the reported SQLs are incorrect.

The USEPA incorrectly applied their own HRS Guidance to the SQLs for copper, lead, nickel, and zinc. The SQLs for copper, lead, nickel, and zinc are incorrect. The HRS Record states that the SQLs were not available. The SQLs should be available in the missing laboratory information which was not included in the HRS Record. In the absence of the SQL's, USEPA guidance *(HRS Guidance Manual, November, 1992)* requires that the Contract Required Detection Limits (CRDLs) be substituted for the SQLs by applying the appropriate sample preparation and dilution factors and dry-weight conversions. The USEPA failed to follow this guidance.

The PCB Aroclor results in sample X111 may be biased high. The potential of a high bias in the Aroclor data exists because the two Aroclors detected (Aroclor 1254 and 1260) in sample X111 have overlapping chromatographic peaks. These two Aroclors have overlapping peaks that would be visible in the chromatograms of the Aroclor standards. The CLP method requires that the laboratory choose unique peaks to accurately quantitate PCB Aroclors. The IEPA validation letter included in Reference 4b does not state that unique peaks were chosen for Aroclor quantitation, nor does it state that this potential bias was reviewed. Therefore, the potential for a high bias exists for the PCB data reported for sample X111. The magnitude of the bias could not be determined due to the missing laboratory data reports.

1.1.2 The USEPA's Use of Bulk Sediment Data Which Is Not Normalized To Appropriate Physical and Chemical Sediment Characteristics To Demonstrate Surface Water Migration of Contaminants Is Not Technically Defensible And Not Consistent With Scientific Methods for Determining Transport in Surface Water Bodies

The USEPA used bulk sediment data which has not normalized to appropriate physical and chemical sediment characteristics to demonstrate surface water transport and migration of substances. This approach is technically indefensible. The analysis of bulk chemical data to assess transport ignores the fundamental scientific understanding that bulk concentrations in sediment, lacking more information, are not technically sufficient to establish movement of substances. Rather, "[t]he accumulation and fate of organic chemicals in sediments are best understood by reviewing the processes involved in sedimentation and chemical-sediment sorption" (Knezovich et al., 1987). An analysis of the static horizontal distribution of surface bulk sediment concentration data does not demonstrate transport from one surface area to another.

The extent to which substances adhere to sediments depends on a variety of factors such as the size of sediment particles and the level of organic carbon in the sediment. Without detailed information about the physical and chemical characteristics of the sampled sediment, contaminant concentrations may reveal less about the concentration to which the sediment was exposed than about the nature of the sediment itself. Unless sediment data are normalized to account for differences in the nature of the sediment, concentrations cannot be compared for the purpose of assessing transport of substances in the environment.

The logic which USEPA used to establish transport for Sauget Area 1 depends on non-normalized bulk sediment data. The USEPA's use of such data conflicts with current state-of-the-practice, developed to a large extent by USEPA, for estimating transport and partitioning of substances in surface water. The proper scientific practice would have been for USEPA to use data which had been normalized to physical and chemical properties of the sediments.

The USEPA Science Advisory Board (USEPA SAB, 1994) identifies several important physical/chemical parameters controlling the partitioning of organics or metals such as total organic carbon, oxides of iron or manganese, the availability of sulfides and sediment grain size. Normalizing data to one of these sediment properties when discussing the mobility of substances is essential for comparison of the data to have meaning. For example, the United States National Oceanic and Atmospheric Administration (NOAA, 1988) routinely normalizes organic contaminants in sediment to total organic carbon, and reports metals and organic data on the basis of sediment grain size. The USEPA comparisons in the HRS Record ignored these fundamental properties and practices which are essential to establishing substance partitioning. Therefore, the approach used by USEPA to demonstrate surface water transport is not a valid scientific approach.

1.1.3 The USEPA Used an Arbitrary Representation of the Data to Establish a Gradient from the Sources to the Release Site.

The USEPA did not consider all of the available data to assess the existence of a gradient. USEPA's belief that it was able to demonstrate a gradient depends upon EPA's selective use of samples and contaminant types. On page 99 of the HRS Scoring Document, the USEPA describes what they believe is a PCB gradient using several selected surface sediment data points. There are several weaknesses in this demonstration. As indicated in subsection 1.1.2, current scientific practice requires that the development of a gradient in sediment concentrations cannot be established without first accounting for various physical properties of the sediment such as organic carbon and particle size. Furthermore, the USEPA selected only those surface soil/sediment samples which support its claim of a gradient and ignored considerable data contradicting any such claim. Figures 5 through 8 show the complete available data set for PCB surface sediment concentrations, including the samples which the USEPA arbitrarily used. As these figures demonstrate, there is no apparent PCB gradient based on this complete data set of bulk surface sediment concentrations.

1.1.4 The USEPA Used a Flawed Sampling Design to Establish a Release of Substances from Sauget Area 1 to the Wetland, and Did Not Follow USEPA Guidance.

The USEPA used a flawed sampling design and did not follow their own guidance in attempting to establish a release of substances to the wetland. Specifically:

> The USEPA ignored the requirements of their own guidance in choosing a release sample from a geologically and environmentally different environment from the background samples;

The USEPA ignored the requirements of their own guidance in choosing a background sample downstream of Sauget Area 1, and a second background sample in a completely different watershed;

The USEPA ignored the requirements of their own guidance in choosing a release sample location which is clearly under the influence of other industrial facilities not associated with Sauget Area 1;

PCBs were not detected in the most downstream source samples, but they re-appear in the wetland release sample which is subject to drainage from other areas; and

The USEPA's sample design did not account for variability in concentrations.

The USEPA ignored the requirements of their own guidance in choosing a release sample from a geologically and environmentally different environment from the background samples

The USEPA guidance (HRS Guidance Manual, 1992, p. 74) requires that "where possible, background and release samples should be collected from the same general part of the surface water body" and "environmental conditions at both the background and release sample locations should be similar." The USEPA did not take the "background" and release samples from the same type of surface water body. The "background" samples are from the bank and channel of Prairie du Pont Creek, while the "release" sample is from a wetland. The Prairie du Pont Creek is a relatively rapidly flowing channel. The wetland is a well vegetated, non-channelized, depositional environment. The USEPA inappropriately compared samples from these two geologically, hydrologically and biologically different environments (see Appendix B for detailed descriptions of the environmental and biological conditions of each location).

The USEPA ignored the requirements of their own guidance in choosing background samples that are not upstream of Sauget Area 1

The USEPA guidance (HRS Guidance Manual, 1992, p. 74) states that "[b]ackground samples should be collected upstream from the potentially contaminated area. USEPA relies on two "background" samples: (1) sample X113 is in Old Prairie du Pont Creek directly downstream of its confluence with Dead Creek; and (2) sample X112 is in Old Prairie du Pont Creek 200 feet directly upstream of the confluence with Dead Creek. "Background" sample X113 is downstream of Sauget Area 1 as well as industrial sources not in Sauget Area 1 which drain to the wetland where the "release" sample was collected. Therefore, it is not an appropriate background sample for establishing an observed release to the surface water migration

pathway. Non-detectable PCB levels in sample X113 strongly suggest that transport of substances from the upstream Sauget Area 1 is not occurring.

"Background" sample X112 is in a separate watershed from Dead Creek where it is under the influence of different sources of contamination. Therefore, this sample cannot serve as a background sample for the Dead Creek watershed.

The USEPA ignored the requirements of their own guidance in choosing a "release" sample location which is clearly under the influence of other industrial facilities not associated with Sauget Area 1

The USEPA guidance (HRS Guidance Manual, 1992a, p. 59) states that "[w]hen other sources are present in the vicinity of the site being evaluated and may have contributed to the significant increase (e.g. in highly industrialized areas), it generally is necessary to obtain sufficient samples between the site being evaluated and other known potential sources (or between the site and adjacent sites) in order to demonstrate an increase in concentration attributable to the site." The SI guidance (pp. 11-12) also indicates the importance of collecting samples to characterize other potential sources between the source being scored and the release sample location. The release sample location USEPA used is downgradient of other potential sources. The sample used to establish a release of substances from Sauget Area 1 is the wetland sample X-111. This wetland is immediately downstream of two culverts (culverts A & B) which discharge surface water runoff from an immediately upstream industrial facility, the Philips Petroleum Compressor Tank Farm. Culvert B further invalidates attribution to Sauget Area 1, because it discharges into the channel of Dead Creek where it enters the wetland. In addition to the tank farm, there are several other industrial facilities and rail lines potentially upstream of these culverts, including an electric power substation. Menzie-Cura & Associates, Inc. personnel observed flow through culvert A to the wetland as recently as July 30, 1996. The location of the tank farm, substation, and culverts are shown in Figure 3. Figure 4 is a diagram which shows the spatial relationships among these other sources, Sauget Area 1, and the "release" and "background" samples. In their description of the release sample location, USEPA ignored the existence of these potential sources which are unrelated to Sauget Area 1 site.

PCBs are not detected in the most downstream source samples, but they re-appear in the wetland release sample which is subject to drainage from other areas

The three Dead Creek sediment samples (X108, X109, X110) immediately upstream of the wetland and upstream of the Philips Petroleum runoff to the wetland do not exhibit detectable levels of PCBs despite the fact that this segment of Dead Creek is a downstream, depositional area, based on recent field observations (see Appendix B). Samples X110, X109, X108 are

upstream in Dead Creek from X111. Therefore, lower levels and non-detectable levels of contaminants in X108, X109, X110, compared to X111, strongly suggest that levels in X111 may be attributable to the tank farm or another upstream source.

The USEPA's sample design did not account for variability in concentrations

There is only one sample used to define a release (and it is subject to at least one source unrelated to Sauget Area 1), and USEPA used only two samples to represent background. In comparing "background" and "release" sample concentrations, USEPA did not account for differences in organic carbon content and grain size. Furthermore, substances may be scoured from the sediments where "background" samples were collected by the fast-moving water of Old Prairie du Pont Creek while the "release" sample sediment is less disturbed in the middle of a wetland.

The HRS Record (reference 65) provides soil metal background levels for metropolitan (urban) areas, including Sauget. These values are based on hundreds of data points rather than the two data points EPA used to establish background conditions. The soil IEPA background data are much higher than X112 and X113 results. If used instead of samples X112 and X113 to define background, lead and mercury would not meet the HRS guidance requirements for an "observed release."

The USEPA's choice of samples to classify Source 1 as a source ignored the recent remedial activities conducted by Cerro Copper.

Key samples listed in the HRS Record as justification for "source" are invalid because the source no longer exists. Samples SD-34, SD-35, SD-36 are in Source 1 which was remediated by Cerro Copper. In November 1990, 27,500 cubic yards of contaminated sediment was excavated before Source 1 was backfilled with clean fill material. As a result of the remediation activities, substances in Source 1 are no longer available to the surface water migration pathway. In fact, Source 1 is not a source at all in its current remediated state.

1.2 Surface Water - Waste Characteristics

The USEPA's quantification of hazardous waste for the Sauget Area 1 sources is incorrect for several reasons:

USEPA incorrectly scored Source 1 and Source 8 as surface impoundments;

USEPA did not account for waste removal at Source 1 as part of Cerro Copper's remediation of this area; and

USEPA did not use their own guidance to evaluate data quality.

1.2.1 The USEPA Misclassified Source 1 as a Surface Impoundment

The USEPA incorrectly scored the waste characteristics scoring element due to their misclassification of Source 1 as a surface impoundment. This area does not meet the definition of surface impoundment as provided in HRS Guidance, based on the information available in the HRS Record.

The USEPA Hazard Ranking System Guidance Manual defines a surface impoundment as:

> "[A] topographic depression, excavation, or diked area, primarily formed from earthen materials (lined or unlined) and designed to hold accumulated liquid wastes, wastes containing free liquids, or sludges that were not backfilled or otherwise covered during periods of deposition; depression may be dry if deposited liquid has evaporated, volatilized or leached; structures that may be more specifically described as lagoon, pond, aeration pit, settling pond, tailings pond, sludge pit, etc.; also a surface impoundment that has been covered with soil after the final deposition of waste materials (i.e. buried or backfilled)" (p. 43).

This definition derives from the Resource Conservation and Recovery Act (RCRA) definition of a surface impoundment (40 CFR 260.10):

> "...a facility or part of a facility which is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it may be lined with man-made materials) which is designed to hold an accumulation of liquid wastes, or wastes containing free liquids, and which is not an injection well."

The HRS Guidance Manual (p. 44) further emphasizes that surface impoundments are distinguished by two characteristics: the waste management unit is intended to contain liquid wastes and lacks a soil cover.

Source 1, also known as Dead Creek Segment A, extends from the Alton & Southern Railroad to New Queeny Avenue (Figure 3). The HRS Record does not demonstrate that this source was ever operated as a surface impoundment. Specifically:

Source 1 was not impounded, but rather, it conveyed storm water to a treatment plant to the north;

Source 1 does not meet USEPA's requirement that a surface impoundment be designed to accumulate liquid wastes; and

In 1988, IEPA identified source 1 as contaminated sediment (Ref. 4a, p. 2-2).

There is no indication in the record that Source 1 was "designed to hold an accumulation of liquid wastes" as required by USEPA's definition of a surface impoundment. The HRS Record indicates that Source 1 received storm water run-off and backflow from a municipal sewer system. However, this runoff and backflow did not accumulate in Source 1, but was released through a sewer drain to a municipal sewage treatment plant or drained south through a storm sewer.

In its May 1988 "Expanded Site Investigation, Dead Creek Project Sites at Cahokia/Sauget, Illinois, Final Report," Ecology and Environment, Inc. asserts that "Creek Sector A reportedly received discharges from Monsanto and other companies prior to 1970" but provides no references describing any such disposal. If such discharges existed however, were not contained in Dead Creek Segment A because the culvert between creek segment A and the downstream creek segment B was not blocked until after this time (Ref. 3b, pp. IA-1 to IA-2). By 1988, Source 1 had been regraded so that it would drain to a catch basin to the north before entering a municipal sewage treatment plant (Ref. 3, p. 2-7). Therefore, the only information in the HRS Record is that this source was never designed to "hold an accumulation of liquid wastes". On the contrary, the open culvert to a downstream creek segment before 1970 and the subsequent regrading to a catch basin clearly indicates that this source was designed to convey water rather than contain it.

Because Source 1 was never managed to contain liquid wastes, it would be appropriately classified as contaminated soil (HRS Guidelines, p. 42-44), if it can be considered as a source at all following its remediation.

The USEPA's classification of Source 1 as a surface impoundment conflicts with IEPA's classification of this source. In its 1992 Screening Site Inspection Report (Ref. 4a, p. 2-2), the Illinois Environmental Protection Agency classified Source 1 as "contaminated sediment."

1.2.2. The USEPA Misclassified Source 8 as a Surface Impoundment

The USEPA misclassified Source 8 as a surface impoundment. Source 8 is an excavated sand mining pit that has filled with water and is connected to Source 2 by a channel. The HRS

Record does not demonstrate that this source was ever operated as a surface impoundment. Specifically:

> Source 8 does not meet EPA's requirement that a surface impoundment be designed to accumulate liquid wastes.

There is no indication in the record that Source 8 was "designed to hold an accumulation of liquid wastes" as required by USEPA's definition of a surface impoundment. Source 8 is a sand pit excavated in the mid to late 1940s. Ecology and Environment, Inc. (E&E) found no information "on file" concerning waste disposal activities in Source 8 (Ref. 3b, p. M-1). Other than some trash disposal on the east bank, E & E found no evidence of waste disposal (Ref. 3a, p. 2-14). No other information regarding specific waste disposal practices at Source 8 occurs in the HRS Record.

Because Source 8 does not satisfy the definition of a "surface impoundment," it would be appropriate to classify it as contaminated soil (HRS Guidelines, p. 42-44).

1.2.3. USEPA Did Not Account for Remediation of Source 1 in its Hazardous Waste Quantity Calculation

Source 1 was remediated by Cerro Copper in November 1990, when 27,500 cubic yards of contaminated sediment was excavated before Source 1 was backfilled with clean fill material. USEPA's hazardous waste quantity calculation does not account for this substantial waste removal at Source 1.

1.2.4 The USEPA Failed to Use Their Own Guidance to Evaluate Data Quality of "Source" Sample Data and Results Presented in the Hazardous Substance Tables

Menzie-Cura reviewed a subset of the data as presented in the hazardous substance tables in the HRS Record. The subset was based upon the specific samples that EPA used to attribute "source" for PCBs, cadmium, copper, lead, mercury, nickel, and zinc (HRS pp. 98-99). Based upon this review of a subset of the "source" data, there is evidence of severe data quality problems with the sediment sample results used to attribute source for both the surface water and air migration pathways (see Appendix A).

The USEPA did not use their own *Qualified Data Guidance* (USEPA 1994) *and SI Guidance* (USEPA 1992) to evaluate data quality and use of qualified data in the HRS Record. These guidance documents require that the chemical results be compared to DUC levels before use and that qualified results be evaluated for usability against rigorous criteria. The USEPA

1994 guidance requires that certain results be multiplied or divided by specific factors, depending upon the bias in the results for both background and release sample results.

Appendix A includes our review of specific sample results for PCBs, cadmium, copper, lead, mercury, nickel, and zinc as presented in the laboratory data packages in HRS Record references. The USEPA used data from several site investigations to attribute "source" for the surface water pathway. Samples were collected and analyzed in 1986 and 1987 by Ecology and Environment (E&E). These sample results were later validated under contract to EPA by PRC Environmental, Inc. (PRC) in 1993 (see HRS Record References 3 and 15). The Avendt Group, Inc. (Avendt) collected samples under contract to EPA in 1990 (see HRS Record Reference 6). There is no indication that the Avendt data were validated prior to use in the HRS.

The USEPA HRS Record does not provide the necessary information to conduct a full review of the data quality. Specifically, the USEPA did not include in the record:

PCB chromatograms for standards used during the analysis of Aroclors for samples EPA used to attribute source (HRS Record Reference 15a and 15g);

Mercury instrument analytical run for November 26, 1996 associated with sample results for SS-30 (HRS Record Reference 15f); and

Many validation reports, (generated by PRC and associated with data from 1986 and 1987; HRS Record References 15a through 15n), include statements about missing data and missing analytical runs. However, the validators chose to accept the associated results as "estimated", qualified "J", even though they could not verify the results or perform the validation on these results because of the missing information.

The USEPA HRS Record exhibits several data quality defects associated with PCB analyses. Specifically:

Aroclor 1254 and Aroclor 1260 results are overestimated (biased high) due to method blank contamination for Aroclor 1254 and overlapping peaks for Aroclors 1254 and 1260;

Uncertainty exists in the quantitation of PCBs because result calculations are incorrect and not verifiable through validation and the peak areas used for quantitation were truncated and rounded before summation; and

Reporting limits are uncertain because they are inconsistent throughout the PCB data we reviewed and are not reproducible based upon the information in the HRS Record.

The USEPA HRS Record also exhibits several data quality defects associated with metals analyses. Specifically:

Accuracy was compromised (biased high) for several cadmium (SD-19 and SS-15) and lead (SD-19) results due to spectral interferences from high levels of iron in the samples (e.g., 58% of the reported cadmium result for SD-19 is potentially due to iron interference);

Accuracy was compromised for several key results for nickel (A11D biased high 40%) and mercury (SS-30 biased high 46%) due to matrix effects;

Precision was compromised for several key results for lead (SS-23 imprecise 52%), copper (SD-19 imprecise 86%), and zinc (SS-30 and SS-31 imprecise 107%) based on field and laboratory duplicate results; and

Sediment heterogeneity is evident in the poor reproducibility of duplicates and in the low percent solids of many samples (The USEPA guidance suggests considering data estimated if < 50% solids); therefore, it is not clear whether the samples are representative of the location sampled.

In conclusion, the PCB data we reviewed do not meet the level of quality required by EPA for use in HRS listing due to severe uncertainty in the quantitations (see Appendix A, section 4). Additionally, the metals data reviewed do not meet the rigorous level of quality required by EPA for use in HRS listing due to imprecision of results and high biases (see Appendix A, section 6). At a minimum, USEPA should have evaluated the biased data using the guidance documents. The validator, PRC, did not use the USEPA guidances (USEPA 1992 and 1994) in validating the data for use in the HRS listing, as based upon the information presented in the HRS Record (reference 15), and PRC considered data valid even when missing laboratory information prevented a full review of the results.

1.3 Surface Water Targets - Human Food Chain

The USEPA score for the human food chain/food chain individual score (HRS regulations Sec. 4.1.3.3.1; guidelines p. 301) depends upon the integrity of the "release" sample X111. As indicated in subsection 1 and 1.1, this sample is inappropriate to use for scoring the human food chain because:

the USEPA did not provide sufficient information to conduct an independent data validation;

the USEPA did not follow their own guidance in selecting the location of this release sample;

the location of the release sample is downstream of industrial facilities which are not part of Sauget Area 1 .

Additionally, the human food chain score for Sauget Area 1 depends on a determination that certain substances allegedly present at Sauget Area 1 have high bioaccumulation rates. This determination rests on only the most generic of information which is specifically contradicted by bioaccumulation information developed by IEPA. IEPA has determined that, for several organic compounds including total PCBs, the local fish population is not accumulating these substances above United States Food and Drug Administration (FDA) Action Levels. The IEPA (IEPA, 1989) conducted an intensive survey of the concentrations of substances in fish tissue throughout the American Bottoms Basin. This measurement program demonstrated that the concentrations of several organic contaminants in fish tissue in Prairie du Pont Creek are similar to the background fish tissue bioaccumulation of organic contaminants in fish throughout the American Bottoms. In particular, these data show that there is no transport and uptake of PCBs to the biota of the Prairie du Pont Creek from any upstream sources in excess of local background in the American Bottoms. The report also demonstrates that these compounds are below FDA Action Levels.

The HRS Record (references 35, 54, and 55) clearly indicates that exposure to substances from Sauget Area 1 to the human food chain through drinking water is not an issue. The record indicates that no drinking water intakes are known to be located within the 15 mile TDL and that the Cities of St. Louis and East St. Louis obtain their drinking water upstream of the TDL. Also the nearest downstream drinking water intake is 20 miles downstream of the confluence of Cahokia Chute and the Mississippi River.

1.4 Surface Water Targets Environmental Threat

Like the human food chain score, the USEPA score for sensitive environments/Level II concentrations (HRS regulations Sec. 4.1.3.3.1; guidelines p. 318-324) depends upon the integrity of the "release" sample X111. As indicated in subsection 1 and 1.3, this sample is inappropriate to use for scoring environmental threat for all of the same reasons it is inappropriate for use in scoring the human food chain threat.

Recent observations (Appendix B) of Sauget Area 1 and its target areas characterize them as ecologically diverse with no evidence of ecological stress. No dead or dying vegetation was observed, no sheens or stains were observed on surface waters or creek banks, no chlorotic plants or mono-specific stands were observed, and pelagic organisms were present in the

The USEPA's choice of samples to classify Source 1 as a source ignored the recent remedial activities conducted by Cerro Copper.

As described in subsection 1.1.4, key samples listed in HRS report as justification for designating Source 1, samples SD-34, SD-35, SD-36, no longer exist because Source 1 was remediated by Cerro Copper. In November 1990, 27,500 cubic yards of contaminated sediment was excavated before Source 1 was backfilled with clean fill material. As a result of the remediation activities, contaminants in Source 1 are not available to the air migration pathway. In fact, Source 1 is not a source at all in its current remediated state.

1.6 Air - Waste Characteristics

The USEPA's quantification of hazardous waste for the Sauget Area 1 sources is incorrect because USEPA incorrectly scored Source 1 and Source 8 as surface impoundments, USEPA did not account for waste removal at Source 1 as part of Cerro Copper's remediation of this area, and USEPA did not use their own guidance to evaluate data quality. See Section 1.2 and Appendix A for a more detailed explanation of these deficiencies.

1.7 Air - Targets

USEPA arrived at its population figure used in the air targets score by adding to its resident population figures (determined by a calculation never detailed in the HRS Record) employees working at Cerro Copper and a nearby Monsanto plant. There are two problems caused by including EPA's estimate of the combined Cerro Copper and Monsanto worker population. First, USEPA used 1993 data to arrive at a worker population estimate of 1,650. Information submitted along with these comments establishes that the correct worker population figure for the two plants is no more than 1,405 workers. Second, USEPA did not attempt to determine whether any of these 1,405 workers also live within the radius they calculated. If they do, USEPA's addition of the worker population figures amounts to double-counting of these individuals and possibly a highly inflated population score.

1.8 The Nine Sources In Sauget Area 1 Should Not Be Aggregated

The nine sources identified by USEPA in Sauget Area 1 should not be aggregated into a single site for several reasons. The sources in Sauget Area 1 are not owned and operated by the same entity, they were subject historically to different waste disposal practices, they represent different source types and one source is not a source at all. For all of these reasons, separate source scores would more accurately reflect the hazards associated with each source.

When we scored each source individually, they all scored far below the 28.5 cut-off for NPL listing. *See* Section 2 of this report.

Scoring each source individually more accurately reflects the hazards associated with them

The nine sources in Sauget Area 1 were subject historically to different waste disposal practices and represent different source types. Based on contaminant concentration data included in the HRS Record, contaminant types and concentrations vary from one source to another. Despite these differences, USEPA attributes to each source a single air migration pathway observed release and a surface water migration pathway observed release based on only one sediment sample.

The air migration "observed release" occurred when a drilling crew punctured a drum at depth. Such a release would not be expected at those sources identified as surface impoundments or contaminated sediment. Moreover, as described in subsection 1.1.4, Source 1 has been remediated and no contamination at Source 1 is available to the air migration pathway.

A surface water "observed release" is based on a single sediment "release" sample and attributed to all nine sources. Moreover, as described in subsection 1.6, Source 1 has been remediated and no contamination at Source 1 is available to the surface water migration pathway. According to the HRS Record, Source 9 contains none of the contaminants identified in the "release" sample (HRS Scoring Document, p. 85).

Source 3 is not a Source

Creek segments C, D and E are identified by USEPA as Source 3; however, the HRS guidance states that water bodies such as rivers should not generally be considered as sources (p. 47). Furthermore, these creek segments were never modified to manage wastes. The HRS guidance states that volumes of air, groundwater, surface water and surface water sediments are not considered sources (even if contaminated by migration of hazardous substances) (p. 49). The HRS scoring improperly characterizes sediment in these creek segments as soil. The unconsolidated material below the surface water along these creek segments are sediments by definition (well sorted, depositional materials with a high moisture content).

Substances at Sauget Area 1 were not deposited using similar means of disposal

Some of the sources in Sauget Area 1 are surface impoundments, surface impoundments that have been backfilled, landfills and contaminated sediment. These sources were not part of the same operation which deposited similar substances using similar disposal practices.

A single strategy for clean-up is not appropriate for all nine sites

Because the nine sources at Sauget Area 1 are different source types, they will likely require different clean-up strategies, if a cleanup were performed for these sources. Source 1 has already been remediated. Surface impoundments and contaminated sediments may involve dredging along with treatment and disposal of sediment while landfills may only involve containment measures including capping and leachate collection. The limited information available about each source in the HRS Record does not permit more detailed predictions about which clean-up strategies will be appropriate.

2.0 Re-Scoring of Sauget Area 1 Under The Hazard Ranking System Based on the Technical Comments

USEPA aggregated the nine sources in Sauget Area 1 before scoring them under the Hazard Ranking System (HRS). Based on the technical conclusions in Section 1 of this report, we re-scored the Sauget Area 1 as a single aggregated source and as nine individual (disaggregated) sources. Using conservative assumptions, we present several alternative re-scoring scenarios for individual sources and for the aggregated sources that fall below the 28.5 cut-off for NPL listing. For each scenario, we describe our assumptions and present summary score sheets.

2.1 Re-Scoring Scenarios For Aggregated Sources In Sauget Area 1

Scenario 1 (Total Score: 8.92)

Assumptions

1. The observed release for the surface water migration pathway has not been established in the HRS Record and is not considered in the scoring. *See* subsection 1.1.

2. In the absence of an observed release for the surface water migration pathway, the maximum score of 500 was used for "potential for release" to surface water as the most highly conservative assumption possible.

3. The population value for the target population within the distance category "> 0 to 1/4 mile" was corrected to reflect the correct combined worker population for Cerro Copper and Monsanto. The USEPA estimate of 1,650 workers was replaced with the correct figure of no more than 1,405 workers. This assumes no overlap between worker and resident populations. *See* subsection 1.8.

4. Source 1 is scored as "contaminated sediment" rather than a "surface impoundment." *See* subsection 1.2.1. This conservatively assumes Source 1 remains a source, despite its remediation.

5. Source 8 is scored as "contaminated sediment" rather than a "surface impoundment." *See* subsection 1.2.2.

6. The observed release for the air migration pathway has not been established in the HRS Record and is not considered in the scoring. *See* subsection 1.5.

7. In the absence of an observed release for the air migration pathway, the "potential for release" was scored using all of USEPA's assumptions, except assigning sources the following source type designations:

Source Number	Source Type (from HRS Appendix A, Table 6-4)
1	contaminated soil
2	surface impoundment; other (i.e. not buried/backfilled and not dry)
3	contaminated soil
4	landfill; no evidence of biogas release
5	landfill; no evidence of biogas release
6	landfill; no evidence of biogas release
7	surface impoundment; buried/backfilled; no evidence of biogas release
8	contaminated soil
9	landfill; no evidence of biogas release

Scenario 2 (Total Score: 9.26)

This scenario is the same as Scenario 1, except the maximum score for the air migration pathway is used.

Scenario 3 (Total Score: 12.02)

This scenario is the same as the Scenario 1, except assumption number 3 is not used.

Scenario 4 (Total Score: 13.78)

This scenario is the same as the Scenario 1, except assumption numbers 3, 6 and 7 are not used.

Scenario 5 (Total Score: 27.82)

This scenario is the same as the Scenario 1, except assumption number 5 is not used.

Scenario 6 (Total Score: 27.82)

This scenario is the same as the Scenario 1, except assumption number 4 is not used.

Scenario 7 (Total Score: 27.82)

> This scenario is the same as the Scenario 1, except assumption numbers 4 and 5 are not used.

2.2 The Nine Sources In Sauget Area 1 Should Not Be Aggregated For HRS Scoring

The HRS Guidance Manual includes a checklist for deciding when sources should be aggregated for HRS Scoring (p. 51). According to the guidance,

> "[i]f the answer to each of these questions is "Yes" then the sources should be aggregated and treated as one source for the pathway. If the answer is "No" to one or more questions, then the sources should be treated separately for the pathway" (p. 51).

Question 1 asks "[c]an the sources be classified as the same source type for the pathway?" According to the HRS Record, the nine sources in Sauget Area 1 include four surface impoundments, four landfills, and one area of contaminated soil. We believe the sources include two surface impoundments, four landfills and three areas of contaminated soil. In either case, the response to question 1 is "no," and the sources should not be aggregated for HRS scoring.

Re-Scoring Scenarios For Disaggregated Sources In Sauget Area 1

We present two scoring scenarios for each source:
Score A: incorporates assumptions 1, 2, 3, 6 and 7; and
Score B: incorporates assumptions 1 and 2.

For Sources 1 and 8, we present a third scoring scenario that incorporates all seven assumptions (Score C). In scoring each of the individual sources, we used USEPA's surface water pathway and air migration pathway target values for the nine aggregated sources. These values are equal to or greater than the values for individual sources; therefore, some scoring elements may be overestimated. The total scores for individual sources range from 1.95 to 13.78.

3.0 References

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SCORING SHEETS

Scenario 1

Assumptions: no air pathway observed release, no surface water pathway observed release (maximum potential to release), target population correction, sources 1 & 8 are contaminated soil

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	**32**	5.00E+00	**0.97**
food chain (fc)	**500**	**320**	**2.00E+00**	**3.89**
environmental (env)	**500**	**320**	**5.00E+00**	**9.70**
SURFACE WATER (SW)				**14.55**
AIR (A)	**450**	**18**	**1.05E+02**	**10.31**

SITE SCORE =8.92

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) The population value for people living in the distance category "> 0 to 1/4 mile" was changed to reflect the correct combined Cerro Copper and Monsanto worker population. The 1993 estimate of 1,650 was replaced with the 1996 correct figure of 1,410.

(3) The air pathway "observed release" was deleted and re-scored as "potential to release."

(4) The surface water pathway "observed release" was deleted and replaced with the maximum "potential to release" score.

(5) Sources 1 and 8 are scored as contaminated soil rather than as surface impoundments.

Scenario 2

Assumptions: no air pathway observed release (maximum potential to release), no surface water pathway observed release (maximum potential to release), target population correction, sources 1 & 8 are contaminated soil

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	**32**	5.00E+00	**0.97**
food chain (fc)	**500**	**320**	**2.00E+00**	**3.89**
environmental (env)	**500**	**320**	**5.00E+00**	**9.70**
SURFACE WATER (SW)				**14.55**
AIR (A)	**500**	**18**	**1.05E+02**	**11.45**

SITE SCORE =9.26

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) The population value for people living in the distance category "> 0 to 1/4 mile" was changed to reflect the correct combined Cerro Copper and Monsanto worker population. The 1993 estimate of 1,650 was replaced with the 1996 correct figure of 1,410.

(3) The air pathway "observed release" was deleted and replaced with the maximum "potential to release."

(4) The surface water pathway "observed release" was deleted and replaced with the maximum "potential to release" score.

(5) Sources 1 and 8 are scored as contaminated soil rather than as surface impoundments.

Scenario 3

Assumptions: no air pathway observed release, no surface water pathway observed release (maximum potential to release), sources 1 & 8 are contaminated soil

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	**32**	5.00E+00	**0.97**
food chain (fc)	**500**	**320**	**2.00E+00**	**3.89**
environmental (env)	**500**	**320**	**5.00E+00**	**9.70**
SURFACE WATER (SW)				**14.55**
AIR (A)	**450**	**18**	**1.95E+02**	**19.15**

SITE SCORE =12.02

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) The air pathway "observed release" was deleted and re-scored as "potential to release."

(3) The surface water pathway "observed release" was deleted and replaced with the maximum "potential to release" score.

(4) Sources 1 and 8 are scored as contaminated soil rather than as surface impoundments.

Scenario 4

Assumptions: no surface water pathway observed release (maximum potential to release), sources 1 & 8 are contaminated soil

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	**32**	5.00E+00	**0.97**
food chain (fc)	**500**	**320**	**2.00E+00**	**3.89**
environmental (env)	**500**	**320**	**5.00E+00**	**9.70**
SURFACE WATER (SW)				**14.55**
AIR (A)	**550**	**18**	**1.95E+02**	**23.40**

SITE SCORE =13.78

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) The surface water pathway "observed release" was deleted and replaced with the maximum "potential to release" score.

(3) Sources 1 and 8 are scored as contaminated soil rather than as surface impoundments.

Scenario 5

Assumptions: no air pathway observed release, no surface water pathway observed release (maximum potential to release), target population correction, source 1 is contaminated soil

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	100	5.00E+00	**3.03**
food chain (fc)	**500**	1000	**2.00E+00**	**12.14**
environmental (env)	**500**	1000	**5.00E+00**	**30.30**
SURFACE WATER (SW)				**45.47**
AIR (A)	**450**	56	**1.05E+02**	**32.07**

SITE SCORE =27.82

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) The population value for people living in the distance category "> 0 to 1/4 mile" was changed to reflect the correct combined Cerro Copper and Monsanto worker population. The 1993 estimate of 1,650 was replaced with the 1996 correct figure of 1,410.

(3) The air pathway "observed release" was deleted and re-scored as "potential to release."

(4) The surface water pathway "observed release" was deleted and replaced with the maximum "potential to release" score.

(5) Sources 1 is scored as contaminated soil rather than as a surface impoundment.

Scenario 6

Assumptions: no air pathway observed release, no surface water pathway observed release (maximum potential to release), target population correction, source 8 is contaminated soil

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	100	5.00E+00	**3.03**
food chain (fc)	**500**	1000	**2.00E+00**	**12.14**
environmental (env)	**500**	1000	**5.00E+00**	**30.30**
SURFACE WATER (SW)				**45.47**
AIR (A)	**450**	56	**1.05E+02**	**32.07**

SITE SCORE =27.82

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) The population value for people living in the distance category "> 0 to 1/4 mile" was changed to reflect the correct combined Cerro Copper and Monsanto worker population. The 1993 estimate of 1,650 was replaced with the 1996 correct figure of 1,410.

(3) The air pathway "observed release" was deleted and re-scored as "potential to release."

(4) The surface water pathway "observed release" was deleted and replaced with the maximum "potential to release" score.

(5) Sources 8 is scored as contaminated soil rather than as a surface impoundment.

Scenario 7

Assumptions: no air pathway observed release, no surface water pathway observed release (maximum potential to release), target population correction

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	100	5.00E+00	**3.03**
food chain (fc)	**500**	1000	**2.00E+00**	**12.14**
environmental (env)	**500**	1000	**5.00E+00**	**30.30**
SURFACE WATER (SW)				**45.47**
AIR (A)	**450**	56	**1.05E+02**	**32.07**

SITE SCORE =27.82

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) The population value for people living in the distance category "> 0 to 1/4 mile" was changed to reflect the correct combined Cerro Copper and Monsanto worker population. The 1993 estimate of 1,650 was replaced with the 1996 correct figure of 1,410.

(3) The air pathway "observed release" was deleted and re-scored as "potential to release."

(4) The surface water pathway "observed release" was deleted and replaced with the maximum "potential to release" score.

SOURCE 1

Score A: no air pathway observed release, no surface water pathway observed release (maximum potential to release), target population correction

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	**32**	5.00E+00	**0.97**
food chain (fc)	**500**	**320**	**2.00E+00**	**3.89**
environmental (env)	**500**	**320**	**5.00E+00**	**9.70**
SURFACE WATER (SW)				**14.55**
AIR (A)	**196**	**18**	**1.05E+02**	**4.49**

SITE SCORE = 7.61

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) The population value for people living in the distance category "> 0 to 1/4 mile" was changed to reflect the correct combined Cerro Copper and Monsanto worker population. The 1993 estimate of 1,650 was replaced with the 1996 correct figure of 1,410.

(3) Air pathway "observed release" deleted and re-scored as "potential to release"

(4) Surface water pathway "observed release" deleted and replaced with maximum "potential to release" score

(5) Source 1 is designated a surface impoundment; buried/backfilled; no evidence of biogas release. If a biogas release was evident, the total score for source 1 would be 8.31.

(6) All EPA values for surface water and air migration pathway target values were used, which are equal to or greater than the values that apply to source 1. Therefore, some scoring elements may be overestimated.

SOURCE 1

Score B: no surface water pathway observed release (maximum potential to release)

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	**32**	5.00E+00	**0.97**
food chain (fc)	**500**	**320**	**2.00E+00**	**3.89**
environmental (env)	**500**	**320**	**5.00E+00**	**9.70**
SURFACE WATER (SW)				**14.55**
AIR (A)	550	**18**	1.95E+02	**23.40**

SITE SCORE = 13.78

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) Surface water pathway "observed release" deleted and replaced with maximum "potential to release" score

(3) All EPA values for surface water and air migration pathway target values were used, which are equal to or greater than the values that apply to source 1. Therefore, some scoring elements may be overestimated.

SOURCE 1

Score C: no air pathway observed release, no surface water pathway observed release (maximum potential to release), target population correction, contaminated soil

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	**18**	5.00E+00	**0.55**
food chain (fc)	**500**	**180**	**2.00E+00**	**2.19**
environmental (env)	**500**	**180**	**5.00E+00**	**5.45**
SURFACE WATER (SW)				**8.19**
AIR (A)	**252**	**10**	**1.05E+02**	**3.21**

SITE SCORE = 4.40

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) The population value for people living in the distance category "> 0 to 1/4 mile" was changed to reflect the correct combined Cerro Copper and Monsanto worker population. The 1993 estimate of 1,650 was replaced with the 1996 correct figure of 1,410.

(3) Air pathway "observed release" deleted and re-scored as "potential to release"

(4) Surface water pathway "observed release" deleted and replaced with maximum "potential to release" score

(5) Source 1 is designated contaminated soil.

(6) All EPA values for surface water and air migration pathway target values were used, which are equal to or greater than the values that apply to source 1. Therefore, some scoring elements may be overestimated.

SOURCE 2

Score A: no air pathway observed release, no surface water pathway observed release (maximum potential to release), target population correction

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	**32**	5.00E+00	**0.97**
food chain (fc)	**500**	**320**	**2.00E+00**	**3.89**
environmental (env)	**500**	**320**	**5.00E+00**	**9.70**
SURFACE WATER (SW)				**14.55**
AIR (A)	**450**	**18**	**1.05E+02**	**10.31**

SITE SCORE = 8.92

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) The population value for people living in the distance category "> 0 to 1/4 mile" was changed to reflect the correct combined Cerro Copper and Monsanto worker population. The 1993 estimate of 1,650 was replaced with the 1996 correct figure of 1,410.

(3) Air pathway "observed release" deleted and re-scored as "potential to release"

(4) Surface water pathway "observed release" deleted and replaced with maximum "potential to release" score

(5) All EPA values for surface water and air migration pathway target values were used, which are equal to or greater than the values that apply to source 2. Therefore, some scoring elements may be overestimated.

SOURCE 2

Score B: no surface water pathway observed release (maximum potential to release)

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	**32**	5.00E+00	**0.97**
food chain (fc)	**500**	**320**	**2.00E+00**	**3.89**
environmental (env)	**500**	**320**	**5.00E+00**	**9.70**
SURFACE WATER (SW)				**14.55**
AIR (A)	550	**18**	1.95E+02	**23.40**

SITE SCORE = 13.78

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) Surface water pathway "observed release" deleted and replaced with maximum "potential to release" score

(3) All EPA values for surface water and air migration pathway target values were used, which are equal to or greater than the values that apply to source 1. Therefore, some scoring elements may be overestimated.

SOURCE 3

Score A: no air pathway observed release, no surface water pathway observed release (maximum potential to release), target population correction

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	**0**	5.00E+00	**0.00**
food chain (fc)	**500**	**0**	**2.00E+00**	**0.00**
environmental (env)	**500**	**0**	**5.00E+00**	**0.00**
SURFACE WATER (SW)				**0.00**
AIR (A)	**300**	**0**	**1.05E+02**	**0.00**

SITE SCORE = 0

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) The population value for people living in the distance category "> 0 to 1/4 mile" was changed to reflect the correct combined Cerro Copper and Monsanto worker population. The 1993 estimate of 1,650 was replaced with the 1996 correct figure of 1,410.

(3) Air pathway "observed release" deleted and re-scored as "potential to release"

(4) Surface water pathway "observed release" deleted and replaced with maximum "potential to release" score

(5) All EPA values for surface water and air migration pathway target values were used, which are equal to or greater than the values that apply to source 3. Therefore, some scoring elements may be overestimated.

SOURCE 3

Score B: no surface water pathway observed release (maximum potential to release)

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	**0**	5.00E+00	**0.00**
food chain (fc)	**500**	**0**	**2.00E+00**	**0.00**
environmental (env)	**500**	**0**	**5.00E+00**	**0.00**
SURFACE WATER (SW)				**0.00**
AIR (A)	550	**0**	1.95E+02	**0.00**

SITE SCORE = 0

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) Surface water pathway "observed release" deleted and replaced with maximum "potential to release" score

(3) All EPA values for surface water and air migration pathway target values were used, which are equal to or greater than the values that apply to source 1. Therefore, some scoring elements may be overestimated.

SOURCE 4

Score A: no air pathway observed release, no surface water pathway observed release (maximum potential to release), target population correction

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	**18**	5.00E+00	**0.55**
food chain (fc)	**500**	**180**	**2.00E+00**	**2.19**
environmental (env)	**500**	**180**	**5.00E+00**	**5.45**
SURFACE WATER (SW)				**8.19**
AIR (A)	**280**	**10**	**1.05E+02**	**3.56**

SITE SCORE =4.46

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) The population value for people living in the distance category "> 0 to 1/4 mile" was changed to reflect the correct combined Cerro Copper and Monsanto worker population. The 1993 estimate of 1,650 was replaced with the 1996 correct figure of 1,410.

(3) Air pathway "observed release" deleted and re-scored as "potential to release"

(4) Surface water pathway "observed release" deleted and replaced with maximum "potential to release" score

(5) Source 4 is designated a landfill; no evidence of biogas release. If a biogas release was evident, the total score for source 4 would be 5.18.

(6) All EPA values for surface water and air migration pathway target values were used, which are equal to or greater than the values that apply to source 4. Therefore, some scoring elements may be overestimated.

SOURCE 4

Score B: no surface water pathway observed release (maximum potential to release)

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	**18**	5.00E+00	**0.55**
food chain (fc)	**500**	**180**	**2.00E+00**	**2.19**
environmental (env)	**500**	**180**	**5.00E+00**	**5.45**
SURFACE WATER (SW)				**8.19**
AIR (A)	550	**10**	1.95E+02	**13.00**

SITE SCORE = 7.68

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) Surface water pathway "observed release" deleted and replaced with maximum "potential to release" score

(3) All EPA values for surface water and air migration pathway target values were used, which are equal to or greater than the values that apply to source 1. Therefore, some scoring elements may be overestimated.

SOURCE 5

Score A: no air pathway observed release, no surface water pathway observed release (maximum potential to release), target population correction

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	**18**	5.00E+00	**0.55**
food chain (fc)	**500**	**180**	**2.00E+00**	**2.19**
environmental (env)	**500**	**180**	**5.00E+00**	**5.45**
SURFACE WATER (SW)				**8.19**
AIR (A)	**280**	**10**	**1.05E+02**	**3.56**

SITE SCORE =4.46

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) The population value for people living in the distance category "> 0 to 1/4 mile" was changed to reflect the correct combined Cerro Copper and Monsanto worker population. The 1993 estimate of 1,650 was replaced with the 1996 correct figure of 1,410.

(3) Air pathway "observed release" deleted and re-scored as "potential to release"

(4) Surface water pathway "observed release" deleted and replaced with maximum "potential to release" score

(5) Source 5 is designated a landfill; no evidence of biogas release. If a biogas release was evident, the total score for source 5 would be 5.18.

(6) All EPA values for surface water and air migration pathway target values were used, which are equal to or greater than the values that apply to source 5. Therefore, some scoring elements may be overestimated.

SOURCE 5

Score B: no surface water pathway observed release (maximum potential to release)

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	**18**	5.00E+00	**0.55**
food chain (fc)	**500**	**180**	**2.00E+00**	**2.19**
environmental (env)	**500**	**180**	**5.00E+00**	**5.45**
SURFACE WATER (SW)				**8.19**
AIR (A)	550	**10**	1.95E+02	**13.00**

SITE SCORE = 7.68

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) Surface water pathway "observed release" deleted and replaced with maximum "potential to release" score

(3) All EPA values for surface water and air migration pathway target values were used, which are equal to or greater than the values that apply to source 1. Therefore, some scoring elements may be overestimated.

SOURCE 6

Score A: no air pathway observed release, no surface water pathway observed release (maximum potential to release), target population correction

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	**32**	5.00E+00	**0.97**
food chain (fc)	**500**	**320**	**2.00E+00**	**3.89**
environmental (env)	**500**	**320**	**5.00E+00**	**9.70**
SURFACE WATER (SW)				**14.55**
AIR (A)	**280**	**18**	**1.05E+02**	**6.41**

SITE SCORE =7.95

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) The population value for people living in the distance category "> 0 to 1/4 mile" was changed to reflect the correct combined Cerro Copper and Monsanto worker population. The 1993 estimate of 1,650 was replaced with the 1996 correct figure of 1,410.

(3) Air pathway "observed release" deleted and re-scored as "potential to release"

(4) Surface water pathway "observed release" deleted and replaced with maximum "potential to release" score

(5) Source 6 is designated a landfill; no evidence of biogas release. If a biogas release was evident, the total score for source 6 would be 9.26.

(6) All EPA values for surface water and air migration pathway target values were used, which are equal to or greater than the values that apply to source 6. Therefore, some scoring elements may be overestimated.

(7) The air pathway "observed release" occurred at source 6; therefore, if the air "observed release" is not deleted, the total score for source 6 would be 9.62.

SOURCE 6

Score B: no surface water pathway observed release (maximum potential to release)

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	**32**	5.00E+00	**0.97**
food chain (fc)	**500**	**320**	**2.00E+00**	**3.89**
environmental (env)	**500**	**320**	**5.00E+00**	**9.70**
SURFACE WATER (SW)				**14.55**
AIR (A)	550	**18**	1.95E+02	**23.40**

SITE SCORE = 13.78

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) Surface water pathway "observed release" deleted and replaced with maximum "potential to release" score

(3) All EPA values for surface water and air migration pathway target values were used, which are equal to or greater than the values that apply to source 1. Therefore, some scoring elements may be overestimated.

SOURCE 7

Score A: no air pathway observed release, no surface water pathway observed release (maximum potential to release), target population correction

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	**32**	5.00E+00	**0.97**
food chain (fc)	**500**	**320**	**2.00E+00**	**3.89**
environmental (env)	**500**	**320**	**5.00E+00**	**9.70**
SURFACE WATER (SW)				**14.55**
AIR (A)	**196**	**18**	**1.05E+02**	**4.49**

SITE SCORE =7.61

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) The population value for people living in the distance category "> 0 to 1/4 mile" was changed to reflect the correct combined Cerro Copper and Monsanto worker population. The 1993 estimate of 1,650 was replaced with the 1996 correct figure of 1,410.

(3) Air pathway "observed release" deleted and re-scored as "potential to release"

(4) Surface water pathway "observed release" deleted and replaced with maximum "potential to release" score

(5) Source 7 is designated a surface impoundment; buried/backfilled; no evidence of biogas release. If a biogas release was evident, the total score for source 1 would be 8.31.

(6) All EPA values for surface water and air migration pathway target values were used, which are equal to or greater than the values that apply to source 7. Therefore, some scoring elements may be overestimated.

SOURCE 7

Score B: no surface water pathway observed release (maximum potential to release)

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	**32**	5.00E+00	**0.97**
food chain (fc)	**500**	**320**	**2.00E+00**	**3.89**
environmental (env)	**500**	**320**	**5.00E+00**	**9.70**
SURFACE WATER (SW)				**14.55**
AIR (A)	550	**18**	1.95E+02	**23.40**

SITE SCORE = 13.78

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) Surface water pathway "observed release" deleted and replaced with maximum "potential to release" score

(3) All EPA values for surface water and air migration pathway target values were used, which are equal to or greater than the values that apply to source 1. Therefore, some scoring elements may be overestimated.

SOURCE 8

Score A: no air pathway observed release, no surface water pathway observed release (maximum potential to release), target population correction

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	**32**	5.00E+00	**0.97**
food chain (fc)	**500**	**320**	**2.00E+00**	**3.89**
environmental (env)	**500**	**320**	**5.00E+00**	**9.70**
SURFACE WATER (SW)				**14.55**
AIR (A)	**450**	**10**	**1.05E+02**	**5.73**

SITE SCORE =7.82

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) The population value for people living in the distance category "> 0 to 1/4 mile" was changed to reflect the correct combined Cerro Copper and Monsanto worker population. The 1993 estimate of 1,650 was replaced with the 1996 correct figure of 1,410.

(3) Air pathway "observed release" deleted and re-scored as "potential to release"

(4) Surface water pathway "observed release" deleted and replaced with maximum "potential to release" score

(5) All EPA values for surface water and air migration pathway target values were used, which are equal to or greater than the values that apply to source 8. Therefore, some scoring elements may be overestimated.

SOURCE 8

Score B: no surface water pathway observed release (maximum potential to release)

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	**32**	5.00E+00	**0.97**
food chain (fc)	**500**	**320**	**2.00E+00**	**3.89**
environmental (env)	**500**	**320**	**5.00E+00**	**9.70**
SURFACE WATER (SW)				**14.55**
AIR (A)	550	**18**	1.95E+02	**23.40**

SITE SCORE = 13.78

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) Surface water pathway "observed release" deleted and replaced with maximum "potential to release" score

(3) All EPA values for surface water and air migration pathway target values were used, which are equal to or greater than the values that apply to source 1. Therefore, some scoring elements may be overestimated.

SOURCE 8

Score C: no air pathway observed release, no surface water pathway observed release (maximum potential to release), target population correction, contaminated soil

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	**18**	5.00E+00	**0.55**
food chain (fc)	**500**	**180**	**2.00E+00**	**2.19**
environmental (env)	**500**	**180**	**5.00E+00**	**5.45**
SURFACE WATER (SW)				**8.19**
AIR (A)	**360**	**18**	**1.05E+02**	**4.58**

SITE SCORE = 4.69

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) The population value for people living in the distance category "> 0 to 1/4 mile" was changed to reflect the correct combined Cerro Copper and Monsanto worker population. The 1993 estimate of 1,650 was replaced with the 1996 correct figure of 1,410.

(3) Air pathway "observed release" deleted and re-scored as "potential to release"

(4) Surface water pathway "observed release" deleted and replaced with maximum "potential to release" score

(5) Source 8 is designated contaminated soil.

(6) All EPA values for surface water and air migration pathway target values were used, which are equal to or greater than the values that apply to source 1. Therefore, some scoring elements may be overestimated.

SOURCE 9

Score A: no air pathway observed release, no surface water pathway observed release (maximum potential to release), target population correction

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	**6**	5.00E+00	**0.18**
food chain (fc)	**500**	**56**	**2.00E+00**	**0.68**
environmental (env)	**500**	**100**	**5.00E+00**	**3.03**
SURFACE WATER (SW)				**3.89**
AIR (A)	**390**	**1**	**1.05E+02**	**0.28**

SITE SCORE =1.95

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) The population value for people living in the distance category "> 0 to 1/4 mile" was changed to reflect the correct combined Cerro Copper and Monsanto worker population. The 1993 estimate of 1,650 was replaced with the 1996 correct figure of 1,410.

(3) Air pathway "observed release" deleted and re-scored as "potential to release"

(4) Surface water pathway "observed release" deleted and replaced with maximum "potential to release" score

(5) Source 9 is designated a landfill; no evidence of biogas release. If a biogas release was evident, the total score for source 9 would be 1.96.

(6) All EPA values for surface water and air migration pathway target values were used, which are equal to or greater than the values that apply to source 9. Therefore, some scoring elements may be overestimated.

SOURCE 9

Score B: no surface water pathway observed release (maximum potential to release)

FACTORS / PATHWAYS	LIKELIHOOD OF RELEASE	WASTE CHARACTERISTICS	TARGETS	PATHWAY SCORE
drinking water (dw)	**500**	**6**	5.00E+00	**0.18**
food chain (fc)	**500**	**56**	**2.00E+00**	**0.68**
environmental (env)	**500**	**100**	**5.00E+00**	**3.03**
SURFACE WATER (SW)				**3.89**
AIR (A)	550	**3**	1.95E+02	**3.90**

SITE SCORE = 2.75

Notes:

(1) Numbers in **bold** have changed from the USEPA original scoring values in the HRS Record.

(2) Surface water pathway "observed release" deleted and replaced with maximum "potential to release" score

(3) All EPA values for surface water and air migration pathway target values were used, which are equal to or greater than the values that apply to source 1. Therefore, some scoring elements may be overestimated.

FIGURES

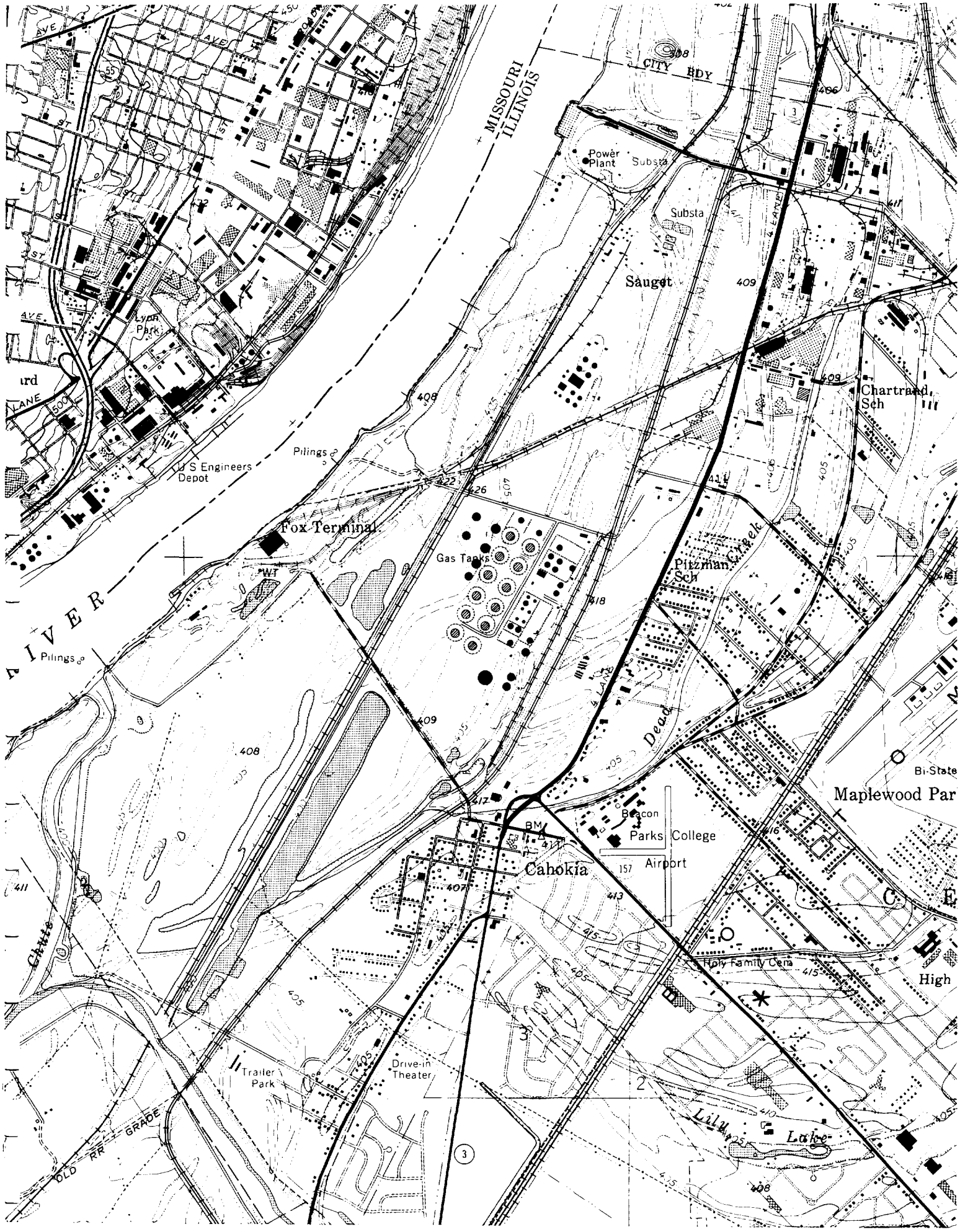
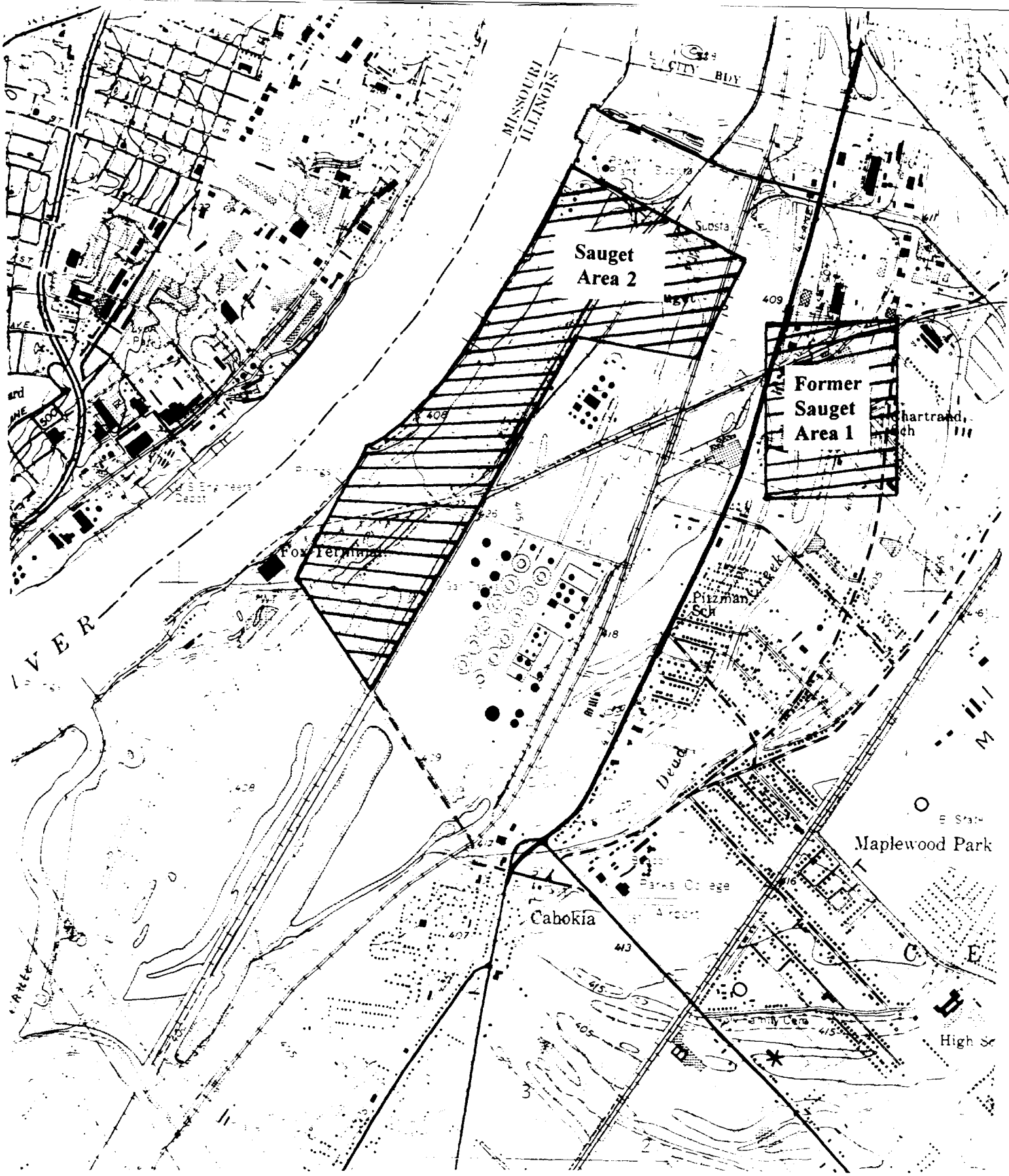


Figure 1. General location of Sauget Area 1.



Sources: USGS Cahokia Quad. 1974 and HRS Record Ref. 3a, p. 2-4.

Figure 2. Locations of the Former Sauget Area 1 and Sauget Area 2 which were subjects of a 1988 Expanded Site Investigation of the Dead Creek Area. The Former Sauget Area 1 represents a portion of Sauget Area 1 that is the subject of scoring in the HRS Record.

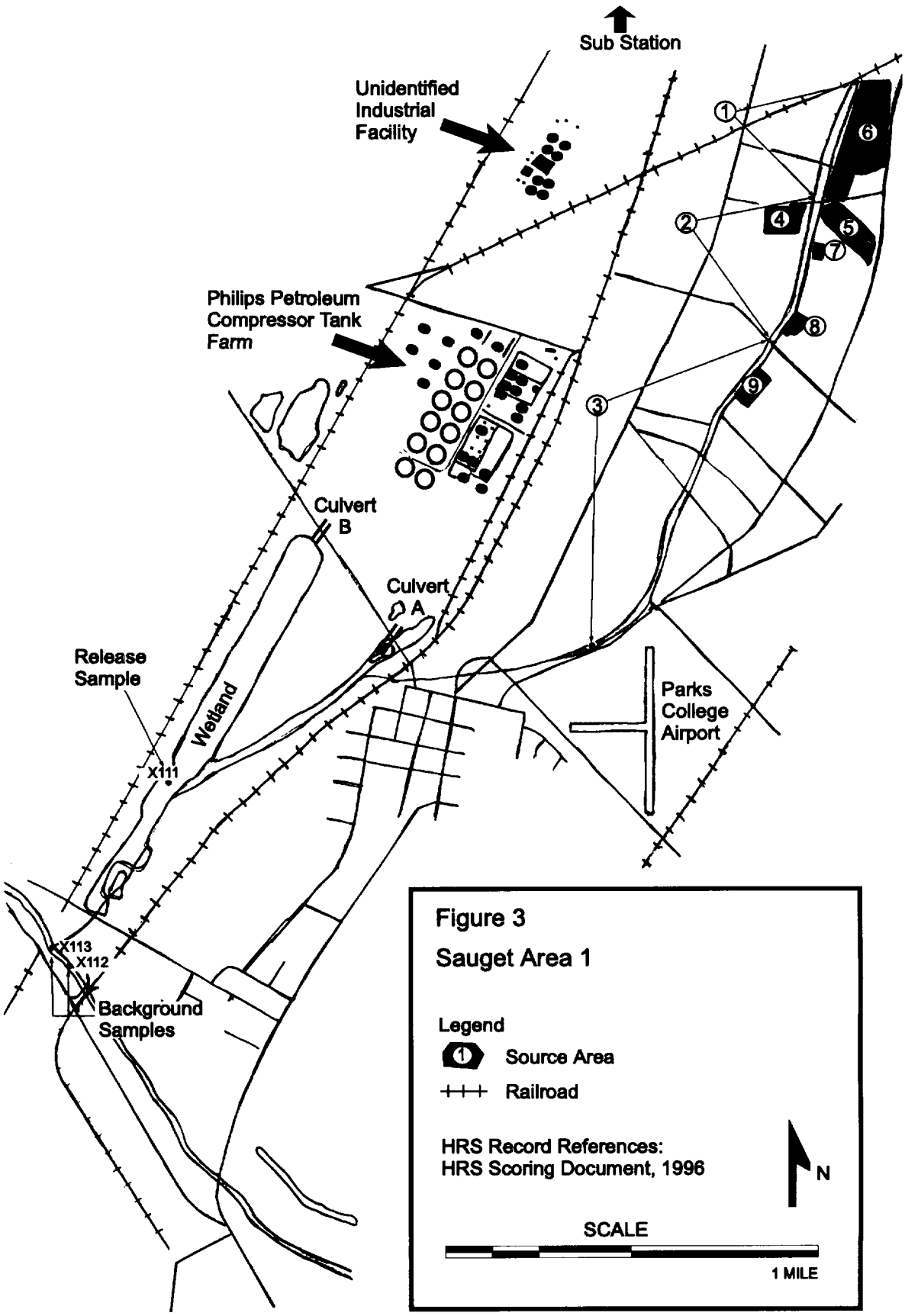


Figure 3

Sauget Area 1

Legend

1 Source Area

Railroad

HRS Record References:
HRS Scoring Document, 1996

N

SCALE

1 MILE

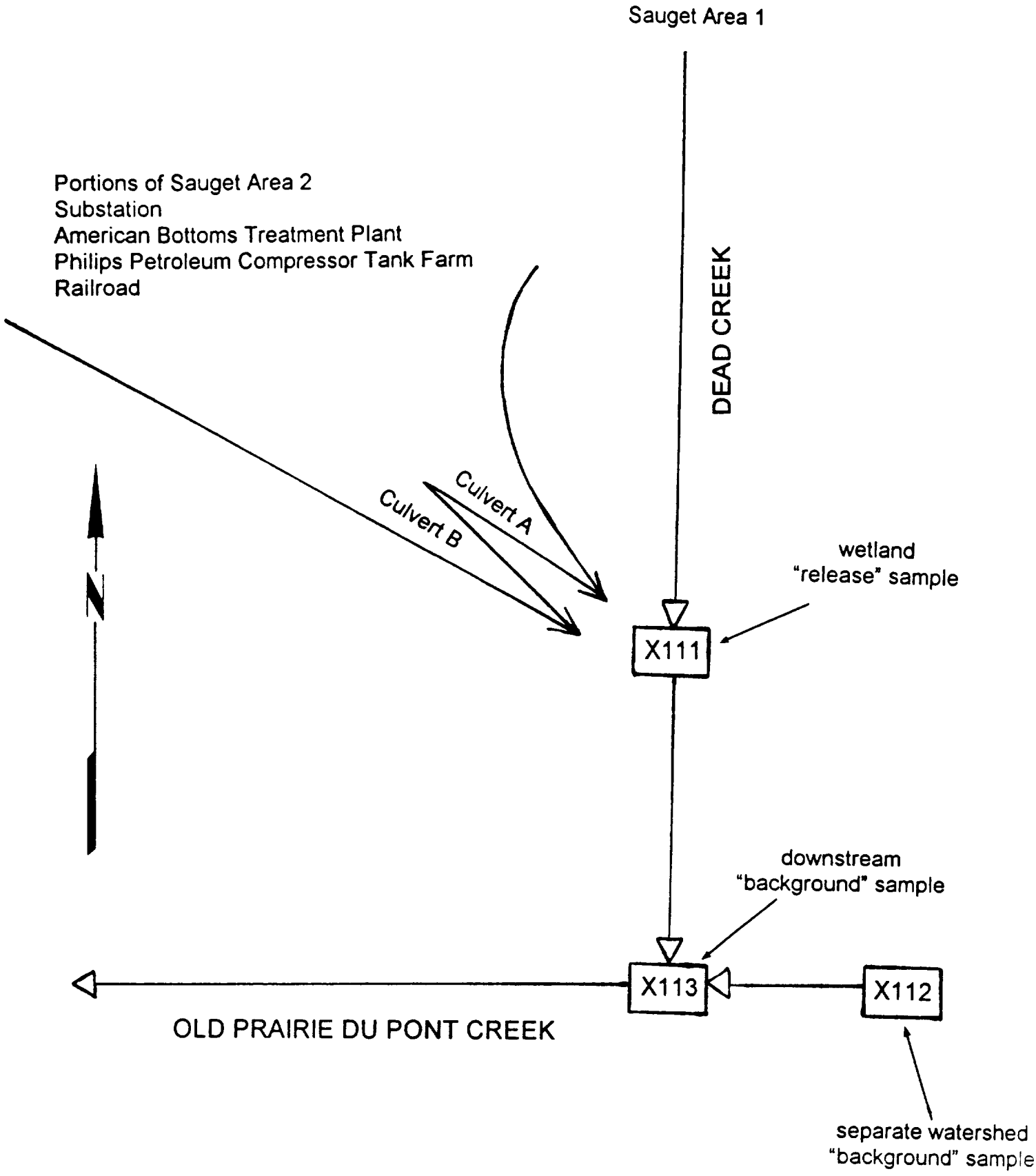
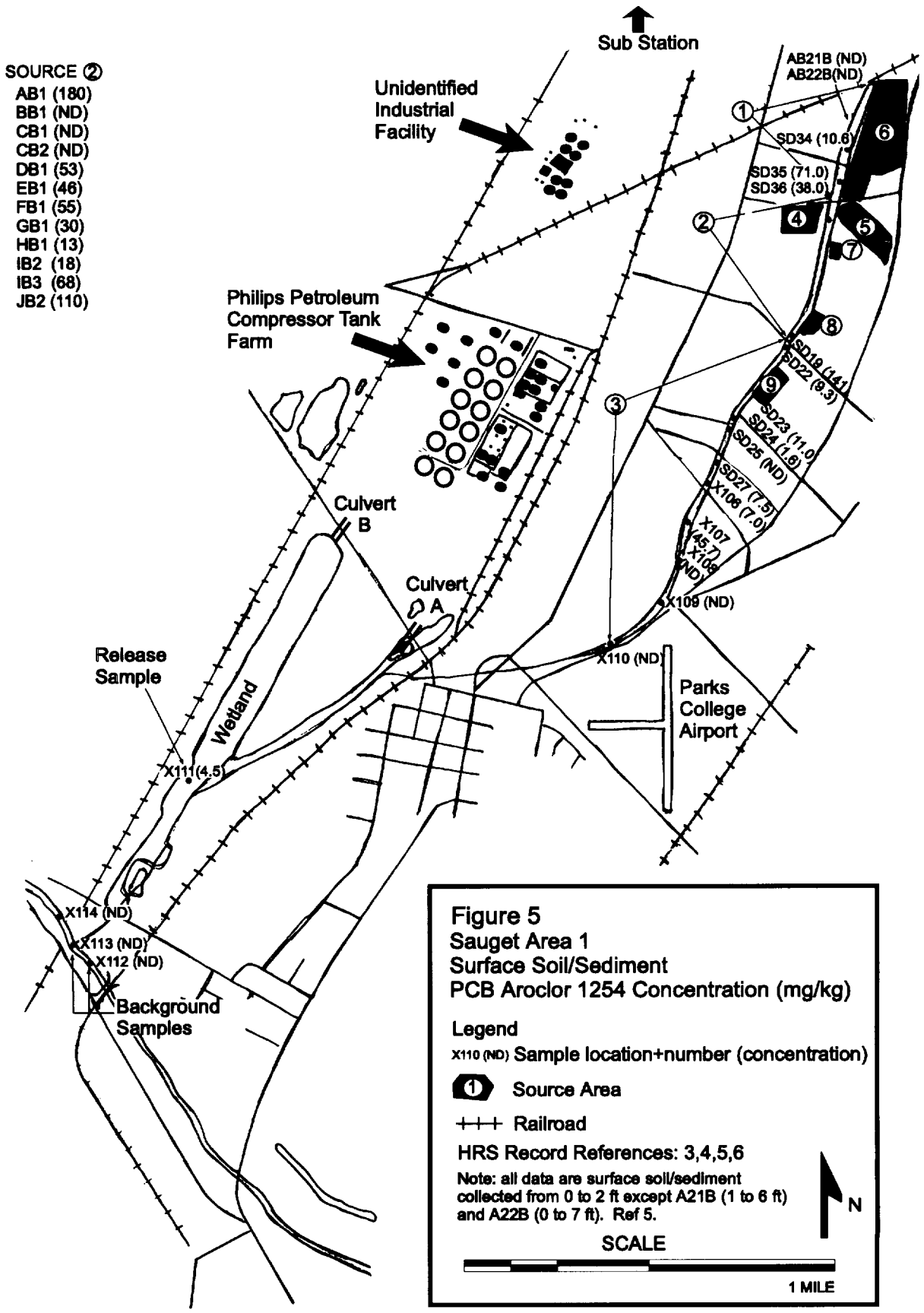
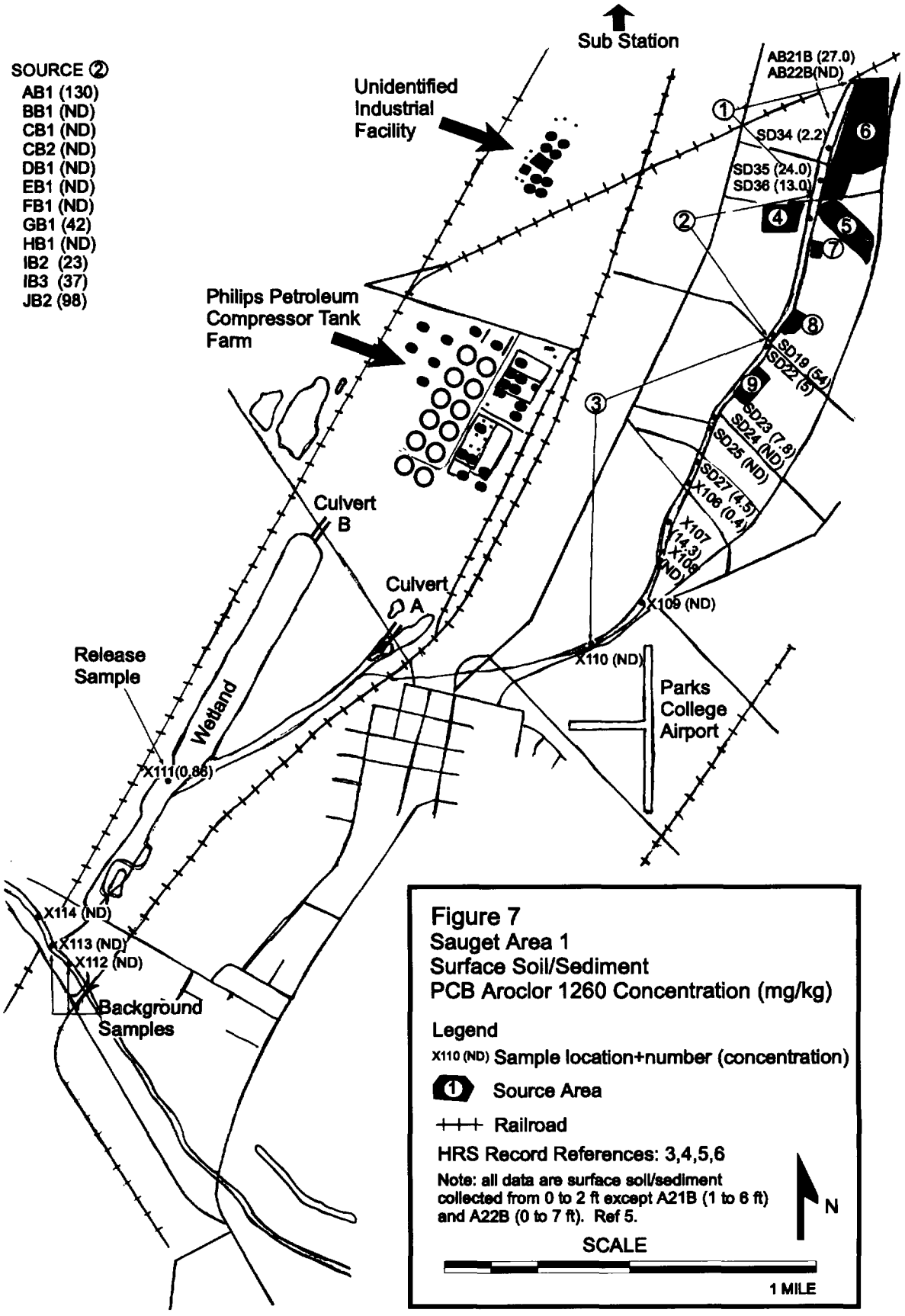


Figure 4. Schematic diagram showing the relationship among Sauget Area 1, the surface water migration pathway "release" sample and "background" sample locations, and other sources located upstream of the "release" sample


SOURCE ②
AB1 (180)
BB1 (ND)
CB1 (ND)
CB2 (ND)
DB1 (53)
EB1 (46)
FB1 (55)
GB1 (30)
HB1 (13)
IB2 (18)
IB3 (68)
JB2 (110)
Sub Station
Unidentified Industrial Facility
Philips Petroleum Compressor Tank Farm
AB21B (ND)
AB22B(ND)
SD34 (10.6)
SD35 (71.0)
SD36 (38.0)
SD18 (141)
SD22 (9.3)
SD23 (11.0)
SD24 (1.6)
SD25 (ND)
SD27 (7.5)
X106 (7.0)
X107 (457)
X108 (ND)
X109 (ND)
X110 (ND)
Culvert B
Culvert A
Release Sample
Wetland
X111(4.5)
X114 (ND)
X113 (ND)
X112 (ND)
Background Samples
Parks College Airport
Figure 5
Sauget Area 1
Surface Soil/Sediment
PCB Aroclor 1254 Concentration (mg/kg)
Legend
X110 (ND) Sample location+number (concentration)
Source Area
Railroad
HRS Record References: 3,4,5,6
Note: all data are surface soil/sediment collected from 0 to 2 ft except A21B (1 to 6 ft) and A22B (0 to 7 ft). Ref 5.
N
SCALE
1 MILE


SOURCE ②
AB1 (130)
BB1 (ND)
CB1 (ND)
CB2 (ND)
DB1 (ND)
EB1 (ND)
FB1 (ND)
GB1 (42)
HB1 (ND)
IB2 (23)
IB3 (37)
JB2 (98)
Sub Station
Unidentified Industrial Facility
Philips Petroleum Compressor Tank Farm
AB21B (27.0)
AB22B(ND)
SD34 (2.2)
SD35 (24.0)
SD36 (13.0)
SD19 (54)
SD22 (5)
SD23 (7.8)
SD24 (ND)
SD25 (ND)
SD27 (4.5)
X108 (0.4)
X107 (14.3)
X106 (ND)
X109 (ND)
X110 (ND)
Culvert B
Culvert A
Release Sample
Wetland
X111(0.88)
Parks College Airport
X114 (ND)
X113 (ND)
X112 (ND)
Background Samples
Figure 7
Sauget Area 1
Surface Soil/Sediment
PCB Aroclor 1260 Concentration (mg/kg)
Legend
X110 (ND) Sample location+number (concentration)
Source Area
Railroad
HRS Record References: 3,4,5,6
Note: all data are surface soil/sediment collected from 0 to 2 ft except A21B (1 to 6 ft) and A22B (0 to 7 ft). Ref 5.
N
SCALE
1 MILE

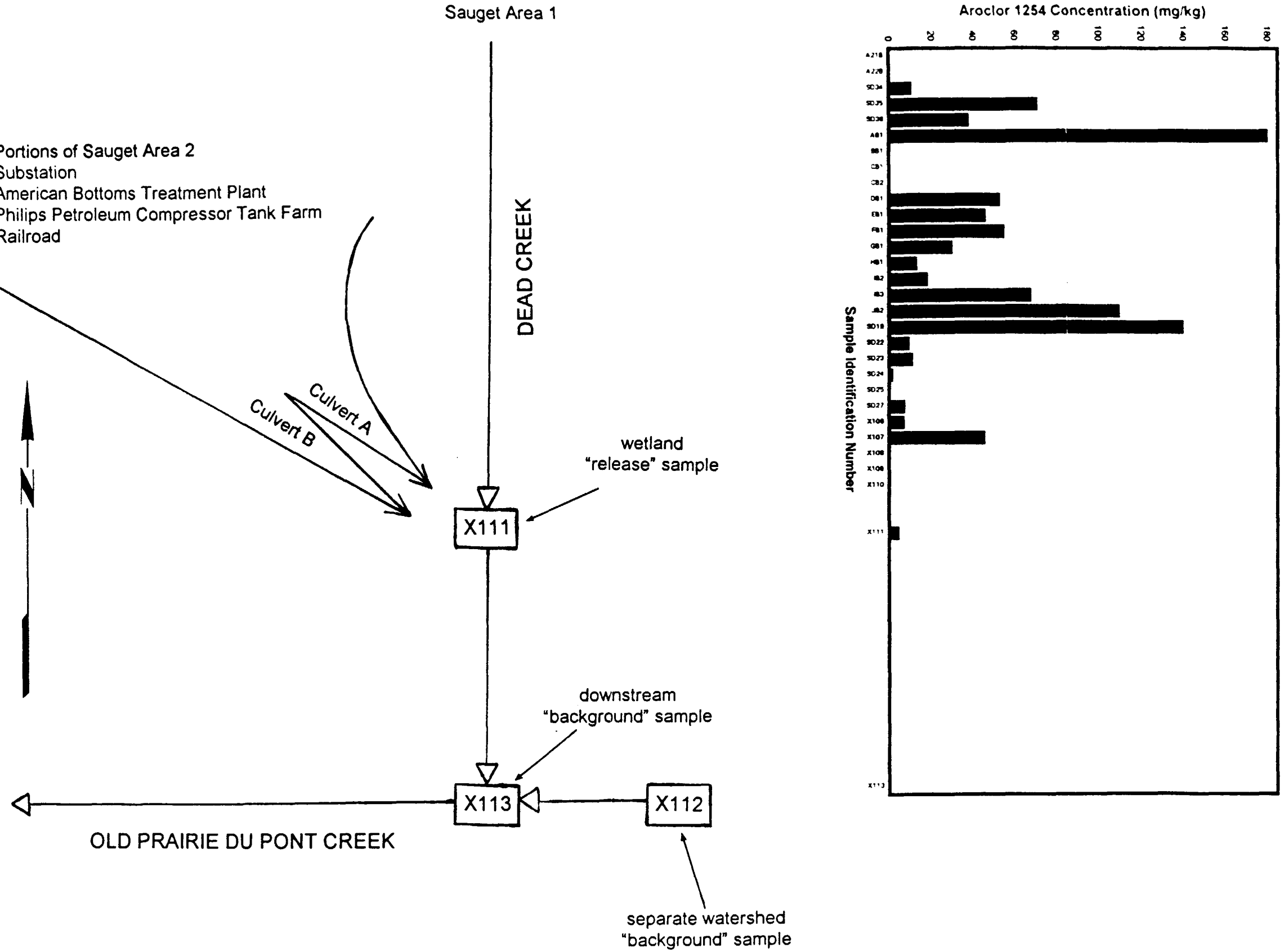


Figure 6. Schematic diagram showing the sediment/soil concentrations for Aroclor 1254 in Sauget Area 1. This diagram illustrates the relationship among Aroclor 1254 sample locations and concentrations, the surface water "release" sample and "background" sample locations, and other sources located upstream of the "release" sample.

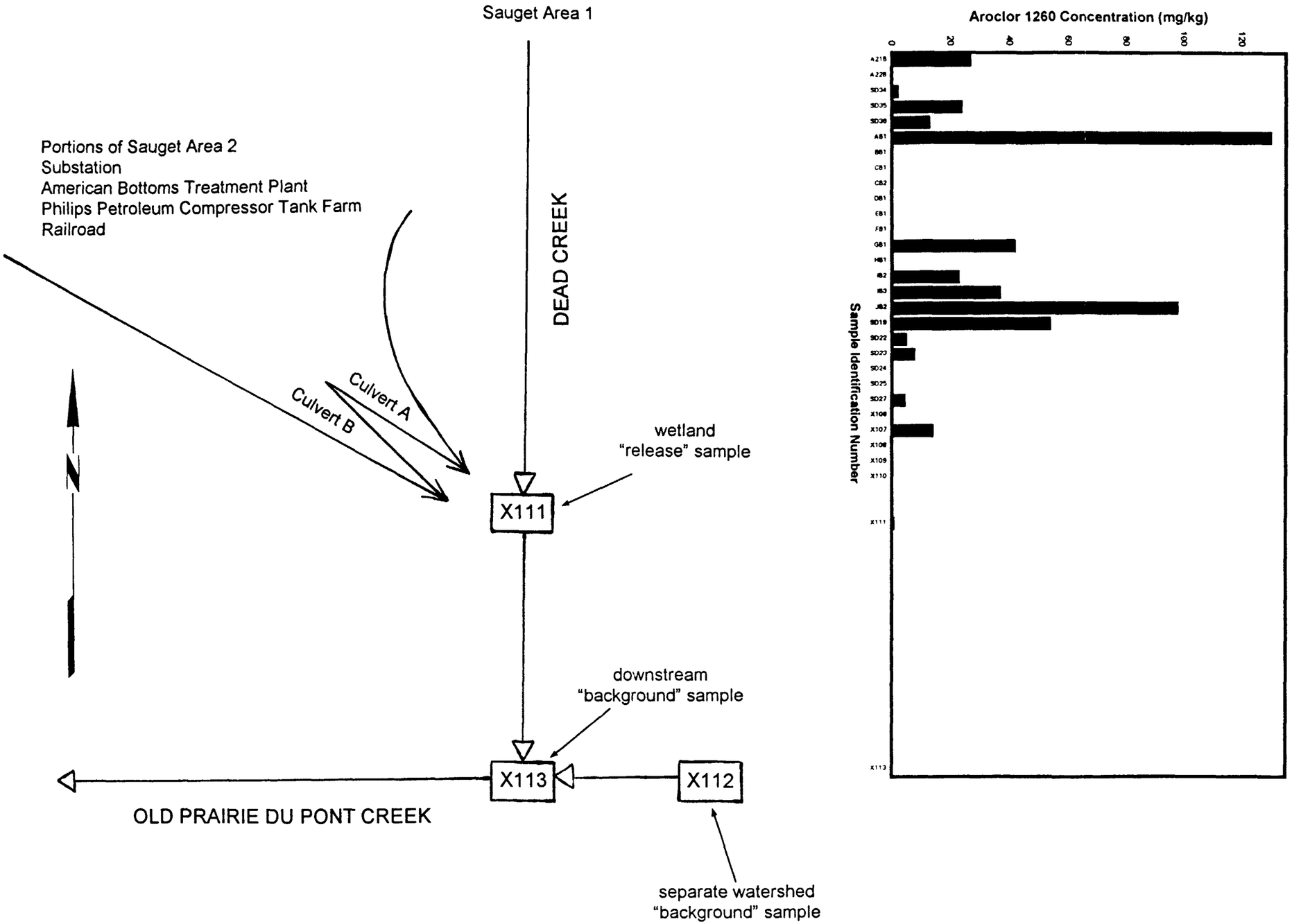


Figure 8. Schematic diagram showing the sediment/soil concentrations for Aroclor 1260 in Sauget Area 1. This diagram illustrates the relationship among Aroclor 1260 sample locations and concentrations, the surface water "release" sample and "background" sample locations, and other sources located upstream of the "release" sample.

Figure 9. Aroclor 1254 Soil /Sediment Concentrations

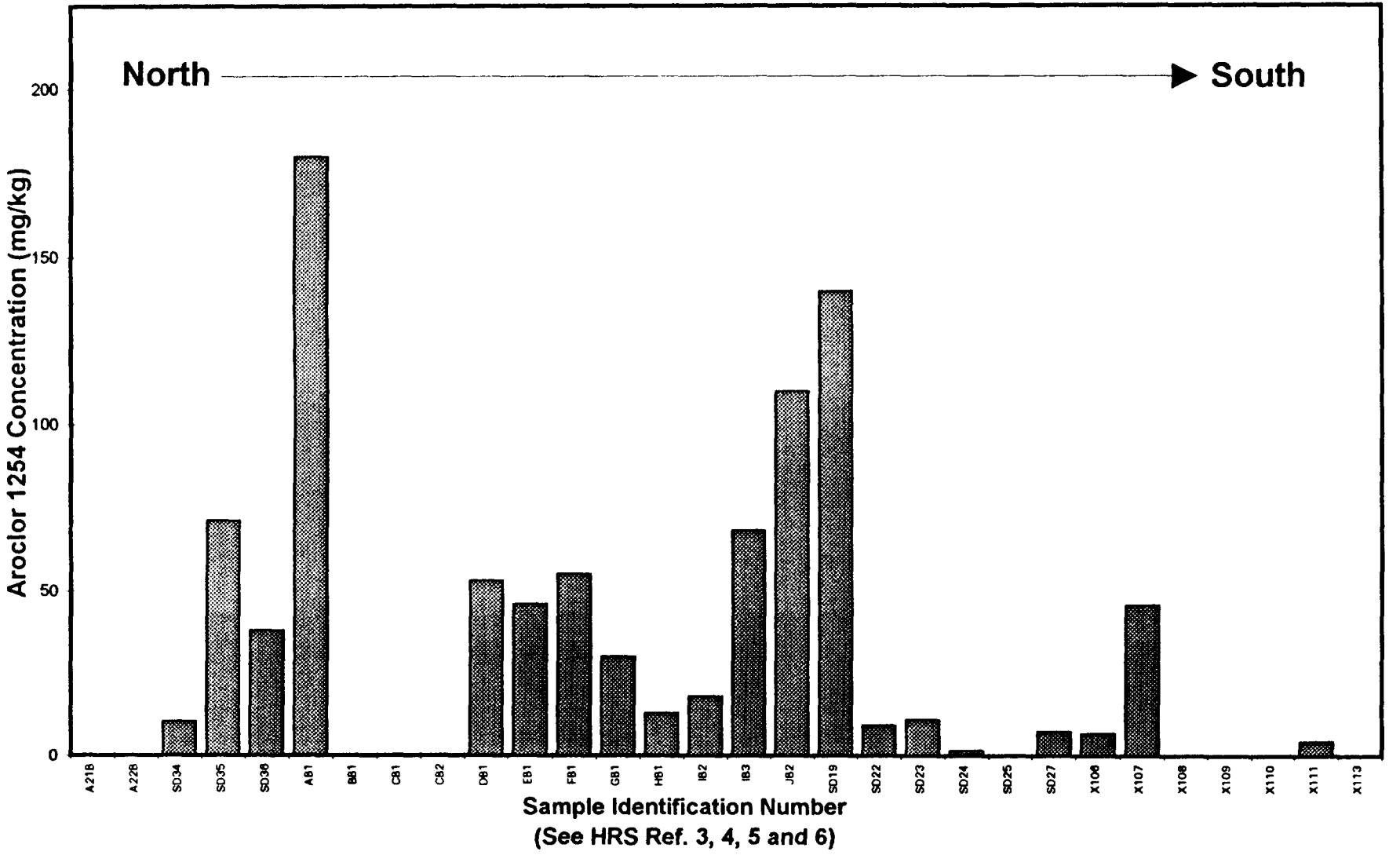
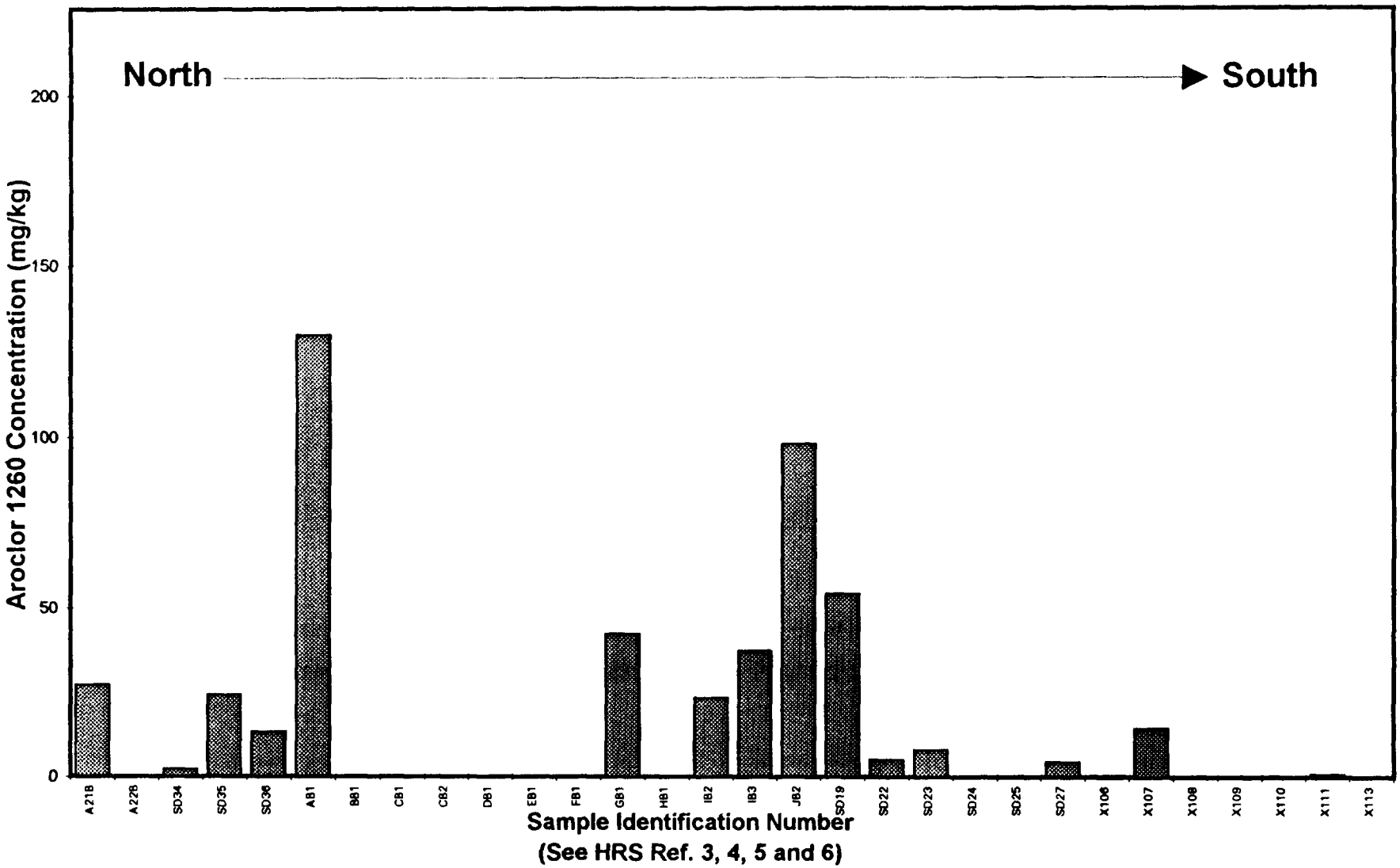


Figure 10. Aroclor 1260 Soil /Sediment Concentrations



Appendix A

Data Usability Review

1 Introduction

At the request of Monsanto Company and under subcontract to Menzie-Cura Associates, Inc., Susan D. Chapnick, M.S., and Nancy C. Rothman, Ph.D., of New Environmental Horizons, Inc. (NEH), conducted a data quality review for a subset of the chemical data used by USEPA in the HRS scoring of Sauget Area 1, St. Clair County, Illinois. Data usability is the process of assuring or determining that the quality of the data meets the needs for the intended use(s) of the data. The purpose of this data usability review was to determine the usability of the data for HRS scoring. Uncertainties in the data used by USEPA in the EPA HRS are documented in this report. This review focused on key indicators of data quality (such as calibration standards, matrix spike and duplicate results, method blanks) that would uncover bias, imprecision, and discrepancies in the results. This review is based upon the data and information included in HRS Documentation Record and Supporting References (HRS Record) and following technical guidance documents and professional judgment:

1. *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review.* USEPA Office of Solid Waste and Emergency Response, EPA-540/R-94-013, PB94-963502, February 1994.
2. *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review.* USEPA Office of Solid Waste and Emergency Response, EPA-540/R-94/012, PB94-963501, February 1994.
3. *Using Qualified Data to Document an Observed Release.* USEPA Office of Solid Waste and Emergency Response, EPA/540/F-94/028, PB94-963311, July 1994.
4. *Hazard Ranking System Guidance Manual.* USEPA Office of Solid Waste and Emergency Response, EPA 540-R-92-026, PB92-963377, November 1992. Interim Final.
5. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.* USEPA Office of Solid Waste and Emergency Response, SW-836, Second and Third editions, 1982 and 1986.
6. *USEPA Contract Laboratory Program Statement of Work for Organic Analysis.* USEPA Office of Solid Waste and Emergency Response, Document No. OLM1.0 and subsequent revisions. 1990 and revisions.
7. *USEPA Contract Laboratory Program Statement of Work for Inorganics Analysis.* USEPA Office of Solid Waste and Emergency Response, Document Nos. SOW 7/87, ILM01, ILM02. 1987 and revisions.
8. *USEPA Guidance for Performing Site Inspections Under CERCLA.* USEPA Office of Emergency and Remedial Response, EPA540-R-92-021, PB92963375, September 1992. Interim Final.

2 Data Reviewed

A subset of the data presented in the HRS Record for Sauget Area 1 were reviewed by NEH. Data were obtained from the HRS Record as listed in the References, pp. 8-14 of the HRS report. Only data that were available in the HRS Record were reviewed. Note that strategic data were not supported in the HRS Record. For example, the supporting documentation for the data presented for the "release" and "background" samples (X111, X112, and X113) used to establish an observed release for the Surface Water Pathway were missing from the record. Table 2-1 lists the references reviewed and the data missing from the HRS Record. Reference numbers are those used in the USEPA HRS report.

Dr. Rothman reviewed the organic constituents and Ms. Chapnick reviewed the inorganic constituents in specific samples identified by EPA in the HRS report. For the Surface Water Pathway, the chemicals reviewed included PCBs (specifically Aroclors 1254 and 1260) and the metals cadmium, copper, lead, mercury, nickel, and zinc. These specific chemicals were evaluated because they were listed by USEPA in the HRS as the hazardous substances that were released to surface water, *via* sediment contamination, from the Sauget Area 1 based upon chemical data for the "release," "background," and "source" samples collected and analyzed from 1987 through 1990 during various site investigations by various contractors (see HRS Record References). In addition to PCBs and metals, a single semivolatile compound (1,2,4,5 tetrachlorobenzene) was reviewed in association with the Air Pathway. Table 2-1 lists the references reviewed by NEH for the data usability evaluation.

Table 2-1. References Reviewed for Data Usability Evaluation

Reference Number	Description	Comments
3a, 3b	Ecology & Environment, Inc. (E&E) Expanded Site Investigation Dead Creek Project Sites at Cahokia/Sauget, Illinois. Volumes 1 and 2. May 1988.	Sediment and soil sample data were reviewed and tabulated for surface concentrations of PCBs and metals. See references 15 for supporting laboratory data report reviews.
4b	IEPA *CERCLA Screening Site Inspection Report*. Volume 2 of 2. 1992.	Sediment and soil samples collected in 1991 and reviewed for PCBs and metals in samples X111, X112, X113. **HRS Record deficient**: Missing supporting laboratory data packages for all samples collected and analyzed by IEPA.
5	Geraghty & Miller, Inc. *Site Investigation for Dead Creek Sector B and Sites L and M. Sauget-Cahokia, Illinois*. March 1992.	Sediment and surface soil samples reviewed and tabulated for surface concentrations of PCBs and metals. Samples collected in 1991 for CS-B, site L, and site M.
6	The Avendt Group, Inc. *Site Investigation/Feasibility Study for Creek Segment A*. Volume 1 of 2. June 1990.	Soil/sediment samples reviewed for nickel in A11D and 1,2,4,5 tetrachlorobenzene in several samples. Also reviewed to compile tables of surface data. Samples collected in 1989 for CS-A, mainly sub-surface. **HRS Record deficient**: Missing Appendix B, QAPP.
15a	PRC Validation of Data; Cases U-4432/U-	Sediment samples reviewed for PCB Aroclors

Reference Number	Description	Comments
	4442; Organic Results including laboratory data packages generated by E & E in 1987.	1254 and 1260. Collected by E&E in 1986. **HRS Record deficient**: Missing chromatograms for PCB standards.
15b	PRC Validation of Data; Cases U-4432/U-4442; Inorganic Results including laboratory data packages generated by E & E in 1987.	Sediment samples reviewed for metals (cadmium, copper, lead, mercury, nickel, zinc). Collected by E&E in 1986.
15f	PRC Validation of Data; Case U-4474; Inorganic Results including laboratory data packages generated by E&E in 1986.	Surface Soil samples reviewed for metals; specifically sample SS-30 for zinc and mercury. Collected by E&E in 1986. **HRS Record deficient**: Analytical data for mercury is missing from data package for SS-30 (analysis date 11/26/86).
15g	PRC Validation of Data; Case U-4465; Organic Results including laboratory data packages generated by E&E in 1987.	Surface Soil sample results reviewed for PCB Aroclors 1254 and 1260. Collected by E&E in 1986. **HRS Record deficient**: Missing chromatograms for PCB standards.
15h	PRC Validation of Data; Case U-4465; Inorganic Results including laboratory data packages generated by E&E in 1987.	Surface Soil sample results reviewed for metals; specifically sample SS-15 for zinc and SS-23 for lead. Collected by E&E in 1986.
52	Semivolatile Organic Analytical Results and volatile organic analytical results for auger sample from hole drilling incident on September 20, 1989. Envirometrics. September 1989.	Soil sample results used to support Air pathway score. No PCBs or metals were analyzed. Collected by Cerro Copper in September 1989 following worker "exposure" incident used to establish observed release.
53	IEPA Memorandum regarding validation of analytical results for one sample delivered to Applied Research & Development Laboratory, Inc. on September 27, 1989. From Ron Turpin to Bob Carson and Gary King. Qualified results attached. October 1989.	IEPA validation of soil sample results used to support Air pathway score. Samples collected by Cerro Copper in September 1989, split sent to IEPA, and analyzed by ARDL, Inc. Only tabulated results presented with lab qualifiers. **HRS Record deficient**: Complete data package is missing from the record.
65	IEPA Summary of Selected Background Conditions for Inorganics in Soil. August 1994.	Background soil data for metals compiled by IEPA for metropolitan areas and non-urban areas of the state of Illinois. Sauget specifically mentioned for high cadmium background levels.

Specific results for chemicals used to determine the HRS for listing purposes must meet DUC-I and DUC-II level rigorous data quality requirements (pg. 100, *Guidance for Performing Site Inspections Under CERCLA*, USEPA 1992) as described in this report, section 3. Not all data used by USEPA for the Sauget HRS scoring were reviewed during NEH's assessment because the focus was on the data used to support the observed releases for the surface water and air pathways. Further evaluation of the data measured against the DUC-I and DUC-II requirements may be important in establishing the validity of the HRS listing.

3 USEPA Data Quality Requirements for HRS Scoring and Listing

USEPA failed to use or reference their guidance documents, *Guidance for Performing Site Inspections Under CERCLA* (USEPA 1992) and *Using Qualified Data to Document an Observed Release* (USEPA 1994) to evaluate the data used in the Sauget HRS. USEPA and their validation contractors (*e.g.*, PRC) did not measure the quality of the results against the DUC level requirements defined in the guidance, nor did they evaluate estimated ("J") results using the guidance. NEH used these USEPA guidance documents in the evaluation of the data presented in the HRS Record that was used in the Sauget HRS listing. Brief summaries of the USEPA guidance are presented in this section.

Section 5.1, Review and Validate Analytical Data, in *Guidance for Performing Site Inspections Under CERCLA*, USEPA 1992, states that "the additive nature of QC factors out of specification is difficult to assess, but the reviewer should inform the user about data quality and limitations. This helps avoid applying the data inappropriately, while still allowing exclusion of the data." Furthermore, Section 5.2, Identify Analytical Data for Scoring, states "qualified data may be used only if the bias (unknown, low, high) associated with the data and the reasons for qualification are known. Some qualified data still may not be appropriate to develop a score for listing.....Analytical data of unknown quality are generally not adequate to score a site." USEPA makes the distinction between data quality required for scoring or listing a site (more stringent) and data quality required for screening investigations. USEPA defines data use categories (DUC) for screening and listing sites. These are defined in Table 5-2 of the CERCLA guidance (USEPA 1992). For listing a site, the DUC-I is recommended for observed release as well as the DUC-II level.

NEH used this guidance to evaluate the quality of the data presented in support of the HRS scoring. NEH reviewed the sample results and quality control (QC) information, as available in the HRS Record, against the rigorous data quality objectives of DUC-I, which are data "associated with a high degree of confidence" (USEPA 1992). For listing, USEPA requires the use of DUC-I and DUC-II data exclusively. DUC-II data are of the same quality as DUC-I but "lack the detailed validation procedures of DUC-I" (USEPA 1992). It is unclear from the guidance exactly what this means. The USEPA guidance also stated, two paragraphs above the DUC level definitions, that if data are qualified, they can be used only if the bias is known and that "some qualified data still may not be appropriate to develop a score for listing." It is unclear how DUC-II data could meet the requirements set forth in the same section of the guidance, two paragraphs above it. NEH interpreted this guidance to mean that DUC-II data had the same rigorous level of quality but may not have all the supporting documentation to validate.

USEPA failed to apply the guidance in *Using Qualified Data to Document an Observed Release*, USEPA 1994. This document details the conditions for use of estimated data (qualified "J" during validation) and tabulates factors that compensate for the bias in the estimated data used for both release and background sample determinations. In summary, this guidance allows for the use of high biased background data and low bias release sample data. However, "high bias release data and low bias background data may not be used at their reported concentrations because they do not establish an observed release with certainty" (USEPA 1994). USEPA did not use this USEPA guidance to evaluate "J" data prior to use in the HRS scoring. Specific instances of where this guidance should have been applied are included in this data usability report.

4 Data Usability of PCBs Used to Demonstrate Source - Surface Water Pathway

USEPA listed several sample results for polychlorinated biphenyl compounds (PCBs) as evidence of a sediment/soil source for the surface water observed release. Specific sample data that were validated and presented in References 15a and 15g have been reviewed herein for compliance with methods used (USEPA, 1982 and 1986) quality of results obtained, and compliance with HRS guidance in using qualified data to determine an observed release (USEPA, 1994). As previously listed in Table 1, chromatograms for the standards associated with these data were missing from the laboratory data packages. Therefore, uncertainty exists, as described in detail below, because the standards could not be validated. PRC validated these data under contract to USEPA. They did not mention the lack of standard chromatograms. This could be either an oversight on PRC's part, or they may have had complete laboratory data packages at the time of their review.

The usability review is divided into sections to represent standard data quality parameters: accuracy, precision, and sensitivity. Additional sections have been added to elucidate discrepancies in the data; these include: record deficiencies in documentation, errors/omissions, and an addendum including example calculations.

The samples reviewed were collected and analyzed by Ecology and Environment, Inc. (E&E) of Buffalo, NY, in 1986 and 1987 under contract to IEPA. PRC Environmental Management, Inc. (PRC) validated the data in May 1993 under contract to IEPA. The following sediment and surface soil sample results were reviewed for PCBs, specifically Aroclors 1254 and 1260.

Ref. 15a: SD-19; SD-23; SD-24; SD-35; SD-36

Ref. 15g: SS-11

E&E analyzed these samples for PCBs using Method 8080, SW-846, Second Edition, and reported the results on USEPA Contract Laboratory Program (CLP) Forms.

4.1 Summary of Technical Usability

These PCB data reviewed and summarized in Table 4-1, below, do not meet the level of quality required by USEPA for use in HRS listing (see section 5.2 of *Guidance for Performing Site Inspections Under CERCLA*, USEPA 1992) due to the severe uncertainty in the quantitations as described in detail in this report, Sections 4.2 through 4.6.

The accuracy, precision, and sensitivity of the results are in question due to a lack of supporting documentation and due to inconsistency in how the laboratory quantitated the various Aroclors. Aroclor 1254 results may be false positives or biased high based on method blank contamination and overlapping quantitation peak contribution from Aroclor 1260. Aroclor 1260 may be biased high due to overlapping peaks for quantitation with Aroclor 1254.

Additionally, severe uncertainty in the accuracy of the quantitations exists based on the inability of NEH to verify the calculated results from the data presented in the laboratory reports (see Addendum 1). Therefore, all E&E PCB data reviewed are considered biased high and uncertain. The data do not meet

USEPA requirements for use in HRS listing though they would be considered usable for an HRS screening which has less rigorous QC requirements (USEPA 1992).

USEPA guidance requires that results considered estimated and biased high must be divided by a specific factor, as tabulated in the guidance (USEPA 1994), prior to use in evaluation of an Observed Release. Though the E&E data were not used to establish the observed release, they were cited as evidence for the source for the release to the surface water pathway (HRS p. 98-99). It is a technically sound approach to apply the USEPA data quality guidance in use of qualified data to the source data as well, so that the release, background, and source chemical data are all comparable values. If this guidance were applied to the source sediment and soil data from E&E, it would require that the results for PCBs be divided by 10 prior to use in documenting an observed release (*Table 3: Factors for Pesticide/PCB Analytes*; USEPA 1994).

Table 4-1. Summary of Technical Usability for Key PCB Results Used to Demonstrate Source for Observed Release

Source (Site)	Sample ID	Depth	Concentrations 1254 / 1260	Qualifier	Data Usability for HRS Scoring
4 (Site G)	SS-11	0-2 ft.	29000 mg/kg 21000 mg/kg	1254 - J false positive or bias high 1260 - J bias high	1254 - unusable due to cumulative QC problems 1260 - unusable does not meet HRS DUC-I requirements
2 (CS-B)	SD-19	0-0.5 ft.	141 mg/kg 54.0 mg/kg	1254 - J false positive or bias high 1260 - J bias high	1254 - unusable due to cumulative QC problems 1260 - unusable does not meet HRS DUC-I requirements
3 (CS-C)	SD-23	0-0.5 ft.	11.0 mg/kg 7.8 mg/kg	1254 - J false positive or bias high 1260 - J bias high	1254 - unusable due to cumulative QC problems 1260 - unusable does not meet HRS DUC-I requirements
3 (CS-C)	SD-24	2-2.5 ft.	1.6 mg/kg ND	1254 - J false positive or bias high	1254 - unusable due to cumulative QC problems
1 (CS-A)	SD-35	0-0.5 ft.	71.0 mg/kg 24.0 mg/kg	1254 - J false positive or bias high 1260 - J bias high	1254 - unusable due to cumulative QC problems 1260 - unusable does not meet HRS DUC-I requirements
1 (CS-A)	SD-36	1.5-2 ft.	38.0 mg/kg 13.0 mg/kg	1254 - J false positive or bias high 1260 - J bias high	1254 - unusable due to cumulative QC problems 1260 - unusable does not meet HRS DUC-I requirements

(ND = not detected)

4.2 Technical Issues Affecting Accuracy

Holding times, initial calibrations, and calibration verifications met criteria for Method 8080 in Ref. 15a and 15g. The GC/ECD Instrument Performance checks all met criteria with the exception of the ending standard for Ref. 15a run on 11/20/86 at 19:00 for which the combined breakdown of DDT/Endrin was 24% (criteria requires combined breakdown to be <20%). This anomaly should not have affected reporting for the Aroclors. The surrogate, Dibutylchlorendate, was diluted out in all samples reviewed; therefore, and assessment of accuracy based on surrogate recovery could not be made.

Several factors affected the accuracy of the reported values for Aroclor 1248, Aroclor 1254, and Aroclor 1260 in all the samples reviewed. These include: Method Blank contamination; inconsistent approach to assigning Aroclor peaks from sample-to-sample; and quantitation procedure. Based upon the cumulative effect of the method blank contamination and the overlapping peak contribution from Aroclor 1260, it is our professional judgment that the Aroclor 1254 results from E&E data are either false positives or severely (greater than 50% of the sample value) biased high. Aroclor 1260 results are likely to be biased high as well due to the contribution of Aroclor 1254 on overlapping peaks.

4.2.1 Method Blank Contamination

All samples reviewed in Ref. 15a were extracted with a Method Blank on 11/12/86. This extraction blank shows contamination on the OV-1 column (primary column used for quantitation of all samples) from about 2.9 to 7.2 min. (major contamination is over by about 5 min.). As a result of this front-end contamination, no peaks prior to about 5 min. should have been included in the calculation of Aroclors even when dilutions were made prior to analysis. All samples reviewed reported Aroclor 1254 by including areas from this front-end region and are therefore deemed inaccurate. Since standard chromatograms were not included (see documentation) it is not known which peaks were used from the Aroclor standards for calculating Calibration Factors so it is not possible to evaluate the magnitude of the bias for Aroclor 1254.

Sample SS-11 from Ref. 15g was extracted on 11/14/86 and two Method Blanks (19A and 19B) were extracted on that date. Lack of the raw extraction information makes assignment of which Method Blank goes with SS-11 impossible. However, both Method blanks show substantial front-end contamination on the OV-1 column up to about 6 min. The sample was diluted substantially for analysis (Dilution Factor = 50,000) therefore, it is not suspected that this front-end extraction contamination would have affected the reported results unless it was introduced at the time of analysis (*e.g.*, within the dilution solvent).

4.2.2 High Bias Suspected Due to Overlapping Peaks for Quantitation

The lack of raw standard chromatograms makes it impossible to know exactly which peaks were used for the Aroclor 1248, 1254, and 1260 Calibration Factors. However, comparison of one sample to another throughout these data indicate that peak assignments were not done consistently.

Aroclor 1254 and Aroclor 1260 have overlapping chromatographic peaks when they are present in the same extract: this overlap is generally worse with packed-column chromatography (used in this work) than with capillary-column chromatography. Each Aroclor has a signature pattern of peaks. When there is overlap, quantitation should be performed using only those peaks that can be unambiguously assigned to each Aroclor; *i.e.*, are "unique." If done in this way, the Calibration Factors (CFs) used for quantitation

must also be adjusted to use only those peaks in the standards that are equivalent to those chosen in the sample. No attempt was made in these data to exclude coeluting peaks from the quantitation. For Ref. 15a, when Aroclor 1254 and Aroclor 1260 are present in the same sample, the results are biased high for Aroclor 1254 since the area of overlap was always assigned to the Aroclor 1254 isomer. Inspection of samples where only Aroclor 1260 was reported (*e.g.*, SD-18) versus those in which both Aroclor 1254 and Aroclor 1260 were reported (*e.g.*, SD-19) indicate an inconsistency in the quantitation procedure. In SD-18, several peaks were used for quantitation of Aroclor 1260 which were assigned to Aroclor 1254 in SD-19.

Sample SS-11 had detected PCB results for three Aroclors: Aroclor 1248, 1254, and 1260 (Reference 15g). The PCB pattern in the area of Aroclor 1254 and Aroclor 1260 is similar to that seen in Ref. 15a; however, in this sample, SS-11, all of the overlapping area was assigned to Aroclor 1260 instead of to Aroclor 1254 as was done in Ref. 15a. Again this points to severe inconsistency in the quantitation of the E&E PCB data.

Another inconsistency with Aroclor 1260 quantitation was observed throughout the data reviewed. In some samples, a single peak area within the pattern was excluded by the analyst (without notation for why the area was rejected), while the same peak was included in other Aroclor 1260 determinations.

In the absence of raw data, NEH was unable to confirm the "unique" peaks that should have been chosen for quantitation of each Aroclor. Furthermore, we were unable to recalculate the concentrations of these Aroclors in the samples to determine the magnitude of the error made by the reporting laboratory (see Addendum 1). NEH's technical evaluation supports a potential false positive or high bias for Aroclor 1254 results and a high bias suspected for Aroclor 1260 results.

4.2.3 Uncertainty in Quantitation Procedure

Areas for quantitation were truncated and possibly rounded prior to summation (*e.g.*, an area count of 259715 was expressed rounded in their calculations as 30.0 or possibly truncated as 25.9). Areas should not have been summed in this manner. At the very least, the full areas should have been summed prior to rounding and truncation. We assumed that the Calibration Factors contained in summary tables within the standards section of the data, were obtained using this same truncated area summation. The absence of raw data precludes verifying this assumption.

During this review, we were unable to reproduce the laboratory's calculations for Aroclors using the information provided on the sample Form Is or using the calculations the lab gave on their data tables. However, there is secondary evidence throughout the data package to suggest that the lab's documentation of what was done may have been in error. The calculated values could be recreated based on the following assumptions and changes from the lab documentation: 1) Injection volume was actually 2 uL instead of 4 uL as reported on the data sheet; 2) Final extract volume, as required by SW-846, was actually 10,000 uL instead of 1,000 uL; and 3) the weight of sample extracted was not exactly 30g as indicated. Addendum 1 details an example calculation for sample SS-11 that illustrates these inconsistencies. Without raw supporting documentation, it is not possible to verify these assumptions and therefore, all PCB values reported are considered uncertain.

The matrix spike and matrix spike duplicate for Ref. 15a were quantitated using peak heights rather than areas since the unspiked matrix was complex; however, NEH was unable to duplicate the

laboratory's method for Peak Height determination (*e.g.*, in SD-15MS, DDT is assigned a height of 22 while Endrin is assigned a height of 52; however, NEH found that the DDT is 9 mm high and Endrin is 33 mm high. If the measurement was done properly for DDT so that a 9 mm height is equivalent to 22 height counts, then Endrin at 33 mm should have been 81 height counts). The measurements for height from peak-to-peak are, therefore, not accurate due to lack of consistency in the laboratory's measurement system. It is also unknown if the laboratory converted the Calibration Factor from Area counts to Height counts prior to performing the calculations. Without the raw standards data, it is not possible to recalculate the spike recoveries or resolve these quantitation errors.

4.3 Technical Issues Affecting Precision

Based upon the Form III, MS/MSD recovery summary, precision criteria were met. However, these recovery values were not able to be verified based upon the preceding discussion of accuracy and since raw information on the extraction and the standard chromatograms were not provided in the HRS Record.

Two field duplicate (or replicate) pairs were included in the data reviewed. These were determined based upon the chain-of-custody records which indicated that these samples had the same sampling date, time, and location. The field duplicates were samples SS-05/SS-06 and SS-15/SS-16. Field duplicate precision criteria of 35% was met for the Aroclors detected in these samples. However, Aroclor 1254 was not reported as detected in either of these samples. Therefore, the potential of overlapping peaks that would have an impact on the certainty of the quantitation, was not reflected in these samples chosen for field duplicate analyses.

4.4 Technical Issues Affecting Sensitivity

The laboratory did not meet sensitivity requirements for the SW846 method used for PCB analysis. Based upon the reporting limits listed for the Method Blanks, the quantitation limits were higher than should have been obtained by a factor of 2 to 4. This is based on SW-846 3rd Edition which gives the Reporting Limit for a low-level soil for alpha-BHC as 2.0 *u*g/kg as compared to the 8.0 *u*g/kg reported by E&E in the Method Blanks.

High dilutions (*e.g.*, SS-11 at 50,000) will also adversely affect the sensitivity for all analytes other than those reported.

4.5 Record Deficiencies in Documentation

The data packages were presented in a manor consistent with the analysis requested; however, based upon the accuracy issues raised previously, a complete assessment of the usability of this information could not be made due to missing information including: standards chromatograms; extraction information; and standard concentrations. Data for the standards and Method Blanks indicate a Dual column GC system was used; however, no information on the samples for this second column was provided. The GC/MS confirmation analysis, which resulted in flagging some of the data with a "C" as confirmed, is only able to verify the presence of PCBs and is unable to distinguish isomers unless verified standards of the isomers are analyzed. In all cases, the PCB(s) was found as a "Tentatively Identified Compound" (TIC) within the GC/MS analysis and therefore, the user should not use this information as a qualitative or quantitative estimate of the PCBs present.

4.6 Errors/Omissions in USEPA Validation by PRC

The review done previously by PRC in May 1993 was not complete and technically in error since their reports did not discuss issues of inaccuracy or inconsistency in the PCB results as noted during this data usability assessment. PRC did not discuss the issue of overlapping quantitation peaks in the reports reviewed.

In addition, in the Ref. 15g data package, PRC indicated that Volatile and PCB data were reported on an "as received" basis (*i.e.,* not corrected for dry weight). We checked several results for volatile organics throughout the package and found that the values were, in fact, reported on a dry-weight basis. Therefore, PRC's section 2.10 on Compound quantitation is in error. Results should not be multiplied by weight correction factors as they are already corrected. Factors within the PCB calculations suggest that the dry-weight correction was made for these results as well; however, the missing raw data concerning extraction volumes prevents us from verifying the dry-weight conversion.

The USEPA validator, PRC, did not evaluate field duplicate precision even though this is a key data quality indicator for overall precision of a sampling/analysis program (see Table 5-1 of USEPA 1992, *Guidance for Performing Site Inspections under CERCLA*).

Additionally, PRC failed to apply the USEPA guidance (USEPA 1994 and 1992) for acceptable data quality for use in HRS listing and scoring. Their validation reports make no mention of evaluating these data using the appropriate guidance documents.

5 Data Usability of PCBs Used to Demonstrate Observed Release - Surface Water Pathway

5.1 Summary of Technical Usability

Sample X111, collected and analyzed by IEPA and located in the wetland, was designated as the release sample for the HRS. The designated background samples in the HRS were X112 and X113. These samples were analyzed by IEPA laboratories using CLP methods.

Key issues affecting the quality of the results used to document an observed release are:

- USEPA did not use their own guidance documents to evaluate data quality and the use of qualified data in the HRS: *Using Qualified Data to Document an Observed Release* (USEPA 1994) and *Guidance for Performing Site Inspections Under CERCLA* (USEPA 1992).
- Potential of a high bias in the Aroclor data exists based upon the detection of two Aroclors in sample X111 and the fact that these Aroclors (1254 and 1260) have overlapping chromatographic peaks.
- Missing documentation and information prevents a full review of the data used for source and observed release.

5.2 HRS Documentation Record Deficiencies

Laboratory data reports, including supporting documentation such as quality control forms, sample and standard chromatograms, extraction logs, surrogate recoveries, matrix spike and duplicate results, method and instrument blank results, are not available in the HRS Documentation Record and Supporting References (HRS Record, Ref. 4b). Only the result forms, CLP Form 1's, are available for review in the record. Therefore, a data usability assessment could not be performed due to the missing laboratory data reports.

5.3 PCB Aroclor Quantitation Bias

It is difficult to accurately quantitate two Aroclors in a single sample because of the overlapping peaks in the standards of Aroclor 1254 and 1260. Therefore, the potential exists for a high bias in the Aroclor 1254 result due to the contribution of a peak from Aroclor 1260 and the potential exists for a high bias in the 1260 result due to the contribution of a peak from Aroclor 1254. The CLP method requires that "unique" peaks be chosen for Aroclor quantitation. Unique is defined as having less than 10% overlap with another Aroclor isomer peak. The IEPA validation letter, included in Reference 4b, does not state that unique peaks were chosen for Aroclor quantitation nor does it state that the potential for overlap was even evaluated. Therefore, there is a strong potential for a high bias in the Aroclor data for sample X111. NEH could not confirm this bias, or evaluate the magnitude of the bias, due to the missing laboratory data reports.

6 Data Usability of Metals Used to Demonstrate Source - Surface Water Pathway

EPA listed several sample results for metals as evidence of a sediment/soil source for the surface water observed release (HRS pp. 95-99). Specific sample data that were validated and presented in references 6, 15b, 15f, and 15h have been reviewed herein for compliance with methods used (USEPA, SW-846, 1982 and 1986) quality of results obtained, and compliance with HRS guidance in using qualified data to determine an observed release (USEPA, 1994). As previously listed in Table 1, missing information from these references affected the completeness of this data usability assessment. PRC validated these data under contract to USEPA.

The usability review is divided into sections to represent standard data quality parameters: accuracy, precision, and sensitivity. Additional sections have been added to elucidate discrepancies in the data; these include: record deficiencies in documentation and errors/omissions.

The samples were collected and analyzed by Ecology and Environment, Inc. (E&E) of Buffalo, NY in 1986 under contract to IEPA and by The Avendt Group, Inc. (Avendt) in support of the Site Investigation/Feasibility Study for Creek Segment A, June 1990. PRC Environmental Management, Inc. (PRC) validated the E&E data in May 1993 under contract to IEPA. There is no indication that the Avendt data were validated prior to use by EPA in the HRS. The following sediment and surface soil sample results were reviewed for the metals cadmium, copper, lead, mercury, nickel, and zinc.

Ref. 6:	A11D
Ref. 15b:	SD-19
Ref. 15f:	SS-30
Ref. 15h:	SS-15, SS-23

E&E analyzed the samples SD-19, SS-15, SS-23, and SS-30 for metals using CLP Statement of Work (SOW) 7/84 and reported the results on CLP forms. The Avendt data for sample A11D were analyzed for Hazardous Substance List (HSL) metals and EPTox Metals. The methods are not included in the report; however, it was assumed that SW-846 methods were employed for these metals analyses based upon the tests performed (these are standard RCRA tests). Laboratory data reports for the Avendt results were not available in the record; however, they were obtained from Menzie-Cura files from Cerro Copper project documents. The laboratory that performed the analyses was Westin Gulf Coast Laboratories, Inc. (Westin) of University Park, Illinois. The data package reviewed for metals was completed on August 23, 1989 by Westin.

6.1 Summary of Technical Usability

A high bias is evident in many of the specific sample results that are listed in the HRS as attributable to source for the observed release. Other results are imprecise based on QC information reviewed. All of the specific metals results reviewed have QC problems that render the data biased high and/or imprecise. Based upon USEPA guidance for data quality of results required for HRS scoring and listing, it is NEH's recommendation that these data reviewed and summarized in Table 6-1 do not meet the rigorous QC requirements required by USEPA (see section 5.2 of *Guidance for Performing Site Inspections Under CERCLA*, USEPA 1992) due to the magnitude of the uncertainty in the data reviewed and because the appropriate USEPA guidance was not applied to the qualified data prior to use in HRS.

Table 6-1. Summary of Technical Usability for Key Metals Results Used to Demonstrate Source for Observed Release

Source	Sample ID	Depth	Metal	Concentration	Qualifier	Data Usability for HRS Scoring
1	A11D	8-10 ft.	nickel	6940 mg/kg	J Biased high 40%	Usable as estimated value with documented high bias
2	SD-19	0-0.5 ft.	copper	15300 mg/kg	J Imprecise 86%	Unusable as imprecise value with undocumented bias
4	SS-15	0-2 ft.	cadmium	46 mg/kg	J Biased high 50%	Usable as estimated value with documented high bias
4	SS-23	0-2 ft.	lead	11700 mg/kg	J Imprecise 52%	Unusable as imprecise value with undocumented bias
4	SS-30	0-2 ft.	mercury	23 mg/kg	J Biased high 46%	Usable as estimated value with documented high bias
4	SS-30	0-2 ft.	zinc	67800 mg/kg	J Imprecise 107%	Unusable as imprecise value with undocumented bias

Note: Though several values reviewed were determined to be usable as estimated values with a high bias and the magnitude of the bias is listed, USEPA failed to follow guidance in HRS scoring in using these qualified results because the bias was not described in the HRS document.

6.2 Technical Issues Affecting Accuracy

Accuracy was compromised for several key results for nickel (A11D biased high 40%) and mercury (SS-30 biased high 46%) due to matrix effects as evident in the high recoveries reported for the matrix spike sample results. These results are biased high and should be considered estimated values.

Accuracy was further compromised for certain metals results quantitated using inductively coupled plasma spectrophotometry (ICP) due to suspected interelement interference from high levels of common spectral interferents (aluminum, iron) in the samples. Spectral interference arises in ICP analyses based on the overlap of element spectra. This interference can be controlled using appropriate background corrections and interelement interference corrections. The ICP instrument used for the analysis of the E&E data, a sequential ICP, does not allow for the input of IECs. Therefore, the potential for overlapping spectra exists. This interelement interference can cause false positive results and/or high bias in the affected metals or false negative results and/or low bias in the affected metal. The following table summarizes the calculated amount of the expected high bias for the affected sample results for those samples presented in Table 2, above. Low bias was not expected based upon the interferents reviewed. The calculations were based upon information presented in the CLP SOWs for inorganic analyses (USEPA 1978 and updates through 1990;

Table 2. Example of Analyte Concentration Equivalents (mg/L) Arising From Interferents at the 100 mg/l Level) and professional judgment.

Table 6-2. Interelement Interference Calculations Based on Concentration of Potential Interferents in Samples

Sample ID	ICP Metal	Conc. Metal in Sample at Instrument	Conc. Interferent in Sample at Instrument	Calculated Positive Interference	Qualifier
SD-19	cadmium	76.72 *ug*/L	148,150 *ug*/L iron	44.4 *ug*/L	J Cadmium Biased High 58%
SD-19	lead	3,729 *ug*/L	24,825 *ug*/L aluminum	42.2 *ug*/L	J Lead Biased High 11 %
SS-15	cadmium	202.6 *ug*/L	336,021 *ug*/L iron	100.8 *ug*/L	J Cadmium Biased High 50%

6.3 Technical Issues Affecting Precision and Representativeness

Precision was compromised for several key results for lead (SS-23 is imprecise by 52%) and copper (SD-19 is imprecise 86%) based upon matrix duplicate results. Criteria for acceptable precision, as based upon the *National Functional Guidelines* (USEPA 1994) is 35% relative percent difference (RPD) for matrix duplicate pairs for soil/sediment samples. A field duplicate for sample SS-30, labeled SS-31, was taken, as listed on the sampling chain-of-custody as the same sampling date and time. For field duplicate pairs, the guidance applies professional judgment. Therefore, the same criteria of 35% RPD was used for field duplicate results. Nickel and zinc did not meet field duplicate precision criteria in the duplicate pairs; the RPDs were 39.1% and 107%, respectively. As the %RPD show, these results for lead, copper, and zinc are significantly outside of acceptable limits for precision. These data are considered imprecise and estimated values that must be used with caution.

Non-representativeness of sample results to site locations is evident in the poor reproducibility of duplicates and in the low percent solids of many samples. EPA guidance suggests considering data estimated if they are less than 50% solids due to sample aliquot heterogeneity and associated problems with representativeness of the sample results to the site location (USEPA Region 1 DV guidance, need reference).

6.4 Technical Issues Affecting Sensitivity

Based on the information in the HRS Record, sensitivity of the analyses for metals met method requirements for SW846 and CLP methods. The instrument detection limits (IDLs) for the metals reviewed met the contract required detection limits (CRDLs) listed in the CLP Statement of Work (SOW). Individual sample quantitation limits (SQLs), however, are higher than the CLP required detection levels for some samples due to the low percent solids of the samples and/or dilutions performed during analysis.

6.5 Record Deficiencies in Documentation

The Quality Assurance Project Plan (QAPP) is missing from the Avendt data (Ref. 6) and should have been included in the record as Appendix B. The planned data quality objectives and QC for this study could not be evaluated based upon the deficiency in the record.

The record was missing raw data for the mercury analysis of 11/26/86 that should have been included in the E&E laboratory data package, Ref. 15f.

6.6 Errors and Omissions in USEPA Validations

Many of the PRC validation reports included in references 15a through n include statements about missing data and missing analytical runs. However, the validators chose to accept the associated results as "estimated" and qualified "J" even though they could not verify the results or perform the validation on these results because of the missing information. Additionally, PRC did not use the appropriate USEPA guidance documents (USEPA 1994 and 1992) to evaluate the quality of the data for specific use of HRS scoring.

7 Data Usability of Metals Used to Demonstrate Observed Release - Surface Water Pathway

7.1 Summary of Technical Usability

Sample X111, collected and analyzed by IEPA and located in the wetland, was designated as the release sample for the HRS. The designated background samples in the HRS were X112 and X113. These samples were analyzed by IEPA laboratories using CLP methods.

Key issues affecting the quality of the results used to document an observed release are:

- USEPA did not use their own guidance documents to evaluate data quality and the use of qualified data in the HRS: *Using Qualified Data to Document an Observed Release* (USEPA 1994) and *Guidance for Performing Site Inspections Under CERCLA* (USEPA 1992).
- The sample quantitation limits for the metals copper, lead, mercury, nickel, and zinc are incorrect.
- Missing documentation and information prevents a full review of the data used for source and observed release.

7.2 Sensitivity

Uncertainty exists in the sample quantitation limits (SQLs) reported for mercury for the release and background samples. The reported SQLs are extremely low for the CLP methods that were used for analysis. The CLP method has a typical SQL (called a contract required detection limit, CRDL, in CLP terminology) of 0.1 mg/kg for soil/sediment samples (prior to dry-weight conversion which would raise the level of the SQL). The reported SQLs for mercury in these samples ranged from 0.03 to 0.04 mg/kg. Due to the missing laboratory data, the SQL could not be confirmed. However, this very low SQL indicates that either a non-CLP method was used for analysis, which would be out of compliance with the CLP SOW, or that the reported SQLs are incorrect.

Additional uncertainty exists in the SQLs reported for copper, lead, nickel, and zinc for the release and background samples. USEPA, in the Sauget HRS, states that the SQLs were not available. The SQLs should be available in the missing laboratory data package information because they are required to be presented on a specific CLP form for reporting purposes. For CLP, the SQLs are actually presented as instrument detection limits, IDLs, from which the SQLs can be calculated using the preparation and dilution factors and the dry-weight conversion for each sample. In any event, if the SQLs could not be located at the writing of the HRS, the USEPA guidance (USEPA 1992) for the HRS requires that the contract required quantitation limits (CRQLs) (equivalent to CRDLs for metals) be substituted by applying the correct preparation and dilution factors. USEPA did not follow this procedure in the HRS (see footnotes to tables in HRS report pp. 97-98).

7.3 Use of Qualified Data

Based upon the results presented in Ref. 4b, we could decipher that lead did not meet quality control criteria for duplicate precision as required by the methods in USEPA CLP protocols. This is evident based

upon the qualification "*" that appears adjacent to the lead results on the Form 1's for the release and background samples. Due to the missing information in the record, the magnitude of the imprecision could not be determined. However, it is clear from the HRS that these lead values were used as reported on these forms (see HRS pp. 97-98). As such, USEPA failed to apply the correct guidance for use of qualified data to document an observed release (USEPA 1994). This guidance requires that the lead value for the release sample (X111) be divided by a specific factor and the lead values for the background samples (X112, X113) be multiplied by this specific factor (see *Table 4: Factors for Inorganic Analytes*, USEPA 1994) because the values reported have been qualified and have an "unknown" bias. EPA did not apply the factors to the lead results prior to using these results to document an observed release in the HRS.

NEH could not complete the review of these data due to the missing laboratory data reports. Therefore, the resultant data quality could not be compared to the USEPA guidance for data quality requirements for use in HRS scoring and listing (USEPA 1992). The guidance requires a DUC-I or II data level (*e.g.*, CLP data) with a high degree of confidence. The IEPA data were performed using CLP methods; however, the qualification of some of the data may render individual chemical results unusable for HRS scoring because "some qualified data still may not be appropriate to develop a score for listing," (USEPA 1992, Section 5.2, *Guidance for Performing Site Inspections Under CERCLA*).

7.4 HRS Documentation Record Deficiencies

Laboratory data reports, including supporting documentation such as quality control forms, instrument printouts, laboratory control sample results, method and instrument blank results, instrument initial and continuing calibration results, matrix spike and duplicate results, and preparation logs, are not available in the HRS Record (see Ref. 4b). Only the result forms, CLP Form 1's, are available for review in the HRS Record. Therefore, a complete data usability assessment could not be performed due to the missing laboratory data reports.

8 Data Usability of Sample Results Presented for Observed Release - Air Pathway

Chemical analyses of air, soil, or sediment samples were not used to establish the observed release for the air pathway. Rather, the observed release in the HRS was established by "direct observation" based upon the incident involving intrusion into the soil to place cameras for security around the Cerro Copper property in September 1989. Nonetheless, chemical data obtained from soil samples from the auger and re-borings were presented in the HRS Record (pp. 132-135). NEH reviewed these data based upon information presented in the HRS Record, References 52 and 53.

8.1 Summary of Technical Usability

The data that are presented associated with the soil samples taken from the auger and the re-boring, for the air pathway observed release, should not be considered valid for use in HRS listing. The data from the auger are qualitative values with no documented quality control. Much of the data from the re-boring, specifically PCBs and metals, are imprecise and inaccurate based upon numerous failed QC. These soil data are not usable for site scoring or listing, as they do not meet DUC-I or DUC-II level requirements (USEPA 1992, *Guidance for Performing Site Inspections Under CERCLA*) based upon the information present in the HRS Record.

8.2 Technical Issues Affecting Accuracy and Precision

The auger sample data presented in Reference 52 are all approximate, qualitative, values, as the laboratory reported all results with a qualifier " ~ ". No dilution factors, quality control (QC) results, or blanks are presented. These data were not validated. These data should not have been presented in the HRS as they are unsupported by adequate QC and questionable as quatitative values. They do not meet DUC-I or DUC-II data quality level requirements for use in HRS scoring or listing.

IEPA sent the re-bored soil sample to ARDL, Inc. laboratory for analysis. Reference 53 includes a letter stating that IEPA validated the data and attached to that letter is the transmittal letter from ARDL and the tabulated analytical results. Though the ARDL transmittal letter states that a complete data package was submitted to IEPA to support these data, the data package is not included in reference 53. Therefore, only the tabulated results with laboratory qualifiers and the validation letter were available for review.

The validation performed by IEPA of the data from ARDL for the re-bored soil sample, states that the results are considered valid despite the fact that many of the QC samples failed criteria. Their reasoning is that the sample contained high levels of organics that prevented adequate QC results. Based upon USEPA guidance for evaluation of data for a site investigations (USEPA 1992) and validation guidance (USEPA 1994) that allows for professional judgment concerning the effect of cumulative QC problems on the usability of the data (USEPA 1992 and 1994), NEH strongly disagrees that the QC exceedances would not affect the use of the data.

Based upon the tabulated results presented in Reference 53, numerous QC exceedances were observed in the soil sample data. As examples: cadmium, copper, lead, nickel, and zinc are all reported with the qualifier "*". This means that all these results failed to meet criteria for acceptable precision as measured by duplicate results. Furthermore, cadmium and zinc also have the qualifier "N" which means that these

results failed to meet criteria for acceptable accuracy as measured by the matrix spike recovery. Zinc also had the qualifier "E" which means that the matrix affected the accuracy of the quantitation on inductively coupled plasma spectroscopy (ICP) as measured by the serial dilution results. It is assumed that the QC criteria used was that required for CLP method analysis (though the method is not stated on the tabulated results, the form used is equivalent to the CLP SOW 7/87 form). It is clear that the metals data do not meet rigorous data quality standards required for use in HRS listing due to the lack of acceptable precision and accuracy in the data.

As an example of the quantitation problems for organic analyses, the Aroclors 1248, 1254, and 1260 were all reported for this sample. It is extremely difficult to accurately quantitate three Aroclors in a single sample due to the problem of overlapping peaks. Two quantitation peaks that are unique to a specific Aroclor are required to be used for CLP analyses. CLP defines "unique" as having less than 10% overlap from another Aroclor. Though the standards were not presented for these data (Reference 53), typically, the standard peaks for Aroclors 1248, 1254, and 1260 have numerous peak overlaps. It is highly likely that the results presented are biased high due to contributions of one Aroclor to the other during quantitation ("double-counting" effects).

8.3 Use of Qualified Data

The numerous QC exceedances mean that the results are uncertain and that the methods used do not give a result for the compounds of interest at the level of certainty required for the intended use of the data. IEPA stated this as well, "Many of the QC results were outside of the limits or not determinable due to the high levels of contaminants in the sample," though they also state that "The results of the QC analyses do not affect the validity of the results since the QC parameters were designed for trace level analyses," (Reference 53). We do not agree with this statement. The level of quality that is defined by specific QC requirements for accuracy and precision should hold even for high level samples. It is not technically acceptable to dismiss the QC exceedances simply because many contaminants are present in a sample. If these data are to be used for HRS listing, they need to meet certain DUC-I and DUC-II level requirements. To meet QC requirements, alternate USEPA-approved methods and specific extraction cleanup procedures could have been implemented.

If these data were to be considered for use in the HRS, the bias of the qualified results must be documented. USEPA guidance requires that the bias in the data, due to QC exceedances, be documented (USEPA 1992, *Guidance for Performing Site Inspections Under CERCLA*, p.99). IEPA did not document the bias in the data in their validation letter nor was the bias documented in the HRS report. In fact, the HRS report does not document that many of the results presented in the Air - Observed Release section were qualified data. USEPA guidance states that "qualified data may be more useful for focused SI screening than to meet the listing objectives during a single or expanded SI" (USEPA 1992, *Guidance for Performing Site Inspections Under CERCLA*, p. 99).

Unfortunately, Reference 53 did not contain the entire laboratory data package (only the result Form 1s); therefore, NEH could not review the data and determine the bias of the results either. NEH concludes, based upon USEPA guidance, that the data reported in the HRS for the air pathway observed release are not usable for site scoring or listing, as they do not meet DUC-I or DUC-II level requirements (USEPA 1992, *Guidance for Performing Site Inspections Under CERCLA*) based upon the information present in the record.

9 Data Usability of Sample Results Presented for Waste Characteristics - Air Pathway

The HRS Record did not include results from the soil sample collected and analyzed in September 1989 from the auger, for the two contaminants that are the drivers for the hazardous substances air migration pathway. These contaminants, mercury and 1,2,4,5 tetrachlorobenzene, were not analyzed in the soil sample obtained from the auger itself. When the boring was resampled and analyzed by IEPA contractor ARDL, Inc., 1,2,4,5 tetrachlorobenzene was not analyzed for in the semivolatile CLP analysis. These substances appear on the table compiled for hazardous substances found in Sauget Area 1, (HRS pp. 137 - 140), based upon data collected in other investigations which include collection of sub-surface as well as surface sample results.

The only time 1,2,4,5 tetrachlorobenzene was analyzed in any of the investigations included in the HRS record was during 1989 sampling by Avendt (Reference 6). The semivolatile analysis was performed for Appendix IX compounds using SW846 methods. Only one sample was taken that could be considered surface soil, sample A22B at a depth of 0-7'. The result for 1,2,4,5 tetrachlorobenzene in this sample was not detected (ND). The only detected 1,2,4,5 tetrachlorobenzene results are at depth; *i.e.*, greater than two feet down. No other data were presented for the 1986 samplings (E&E data, References 3 and 15), the 1991 sampling/analysis program (G&M, Reference 5), or the 1991 sampling/analysis performed by IEPA (Reference 4) because these analyses were performed using methods that do not contain 1,2,4,5 tetrachlorobenzene on the compound lists (SW846 hazardous substance list (HSL) and the CLP compound list were used).

Many of the contaminants included in the hazardous substance table in the HRS report were found at depth (greater than 2 feet down), as detailed above for 1,2,4,5 tetrachlorobenzene. Additionally, many of the PCB results reported for surface samples and at depth, are likely to be biased high. The PCB data associated with all the sampling events from 1986 through 1991 have the potential of a high bias whenever more than one Aroclor was detected in a single sample (due to the contribution of Aroclors with overlapping peaks) as previously discussed. Uncertainties in the metals data were also uncovered including high biases and imprecision of results. The data quality problems uncovered in the review of the subset of PCB and metals data in sections 4 and 6 may be present in the data included in the hazardous substances tables as these tables included some of these specific samples that were reviewed.

Addendum 1 - Example Sample Calculation for PCBs

SS-11 sample calculation from Ref. 15g

$$\text{Conc. analyte} = \frac{\text{Area in sample X Volume of extract X DF}}{\text{(CF of standard X Volume injected X Weight extracted X Dry weight factor)}}$$

From the laboratory Form Is:

Vext = 1000 *uL*
DF = 50,000
Vinj = 4 uL
Weight extracted = 30g
Dry weight factor = 0.641 (%Moisture = 35.9%)

Date Analyzed = 11/26/86 3:08 with quantitation done on the OV-1 Column (Channel A)
Pesticide/PCB Standards Summary (pp. 65-68) form shows:

CF1248 = 149
CF1254 = 210
CF1260 = 207

Summing areas of peaks attributed to each Aroclor using all figures on the data table and using the laboratory's method of expressing areas in ten-thousandths (also assuming CFs are calculated in the same fashion), we calculated

Area 1248 = 217 (same as lab)
Area 1254 = 221 (same as lab)
Area 1260 = 260 (lab used 261)

Using the above equation:
Conc. 1248 = 950,000 ug/kg (lab reported 24,000,000)
Conc. 1254 = 710,000 ug/kg (lab reported 29,000,000)
Conc. 1260 = 820,000 ug/kg (lab reported 21,000,000)

A comparison of the reported Aroclor concentrations with the calculated concentrations, discrepancies seen in data from Ref. 15a, and a review of their RLs compared to the reviewers calculated RLs suggest that either the lab's documentation process was error or the concentrations reported are incorrect.

If we assume:

1) the laboratory had actually used a 10 ml extract (as the method requires) instead of 1 ml;
2) the injection volume was actually 2 uL instead of 4 uL since 4 uL injected into a GC with a splitter to two columns allows each column to only see 2 uL (QC and standards indicate that a two channel GC was employed - Channel A = OV-1 and Channel B = SP2250/SP2401);
3) Sample weight extracted was not exactly 30g. For this sample, if 30g was extracted, the Reporting Limit for alpha-BHC should have been 620,000 ug/kg; however, the lab reported 800,000 ug/kg. The only factor that could affect the Reporting limit in this way would be that the sample size was not 30 g but rather about 23g (30g x 620,000/800,000).

Using these assumptions, the calculated values for concentration are:

Conc. 1248 = 24,700,000 ug/kg (lab reported 24,000,000)
Conc. 1254 = 17,800,000 ug/kg (lab reported 29,000,000)
Conc. 1260 = 21,300,000 ug/kg (lab reported 21,000,000)

During this data usability assessment, we have been unable to reproduce the laboratory's handwritten notes on their calculation of concentration. The value for AR1254 is surely in error since it's Area is similar to that of AR1248. Therefore, the only variable in the calculation for concentration between these two isomers is CF. The ratio of CF1248 to CF1254 is 0.74; therefore, AR1254 should be at a concentration about ¾ of the AR1248 value. Without raw data (standard chromatograms) and since the laboratory did not document what and how they performed the Aroclor quantitations, it is not possible to verify the calculations or confirm the assumptions we used in re-calculating the results.

APPENDIX B
SITE AND TARGET AREA BIOLOGICAL OBSERVATIONS

Site Evaluation, Monsanto Plant/Dead Creek, Sauget & Cahokia, IL

On 29-30 July 1996, David Peterson, Certified Wildlife Biologist, visited the Sauget Area 1 in Sauget and Cahokia, Illinois and conducted an evaluation of local habitats and sensitive environments (as defined under the HRS Guidance Manual). Observations were made of ecological resources along Dead Creek, Prairie du Pont Creek, the wetland area in the location of the release sample, Cahokia Chute, and the Mississippi River. In addition, federal/state agencies and private conservation organizations were contacted concerning additional ecological information available about the area (see Attached List).

Several categories of HRS-defined sensitive environments were located in the Monsanto/Dead Creek area: Habitat Known to be Used by Federal Designated or Proposed Endangered or Threatened Species, Habitat Known to be Used by State Designated Endangered or Threatened Species, and Wetlands. Each of these environments were investigated in the vicinity of the Monsanto facility and downstream areas.

Habitat Known to be Used by Federal Designated or Proposed Endangered or Threatened Species

According to the records of the Illinois Department of Natural Resources' Natural Heritage Inventory, the only federally endangered or threatened species in the study area is the federally threatened bald eagle (*Haliaeetus leucocephalus*). In 1993, a pair of eagles unsuccessfully attempted to nest at the southern tip of Arsenal Island, where the ditched portion of Prairie du Pont Creek enters the Mississippi River. The pair apparently were scared off the site. The next year the pair returned to the island, but no monitoring was conducted to determine if they successfully nested. During the late July 1996 survey I did not observe any eagles in the study area. Remains of a large stick nest were observed at the southern tip of Arsenal Island, but it did not appear to have been used during 1996.

Eagle foraging habitat in the area appears to be waterbodies large enough to support large fish such as carp and catfish. The Mississippi River, the channelized section of Prairie du Pont Creek, and a borrow pond at the lower end of Dead Creek all appear to support large fish and provide enough open water for eagles to fish. No foraging eagles were observed during the site visit, nor have local people in the area seen eagles in the vicinity.

Habitat Known to be Used by State Designated Endangered or Threatened Species

The Illinois Natural Heritage Inventory did not have any records of state-listed endangered or threatened species in the study area. However a number of state-listed wading birds were observed throughout the wetlands and waterways downstream of the Monsanto site. Illinois endangered species observed were little blue heron (*Egretta caerulea*), snowy egret (*Egretta*

thula)[1], and black-crowned night heron (*Nycticorax nycticorax*). Great egret (*Casmerodius albus*), an Illinois threatened species, was also observed. Small numbers (one to ten individuals) of these wading birds were found foraging along sections of Dead Creek, the ditched length of Prairie du Pont Creek, Cahokia Chute, and the Mississippi River. The largest concentrations of foraging herons (approximately ten individuals at a location) were observed at the confluence of Dead Creek and the ditched Prairie du Pont Creek, and where the ditched Prairie du Pont flows into the Mississippi. These areas likely support the best concentrated fishing areas along the waterways, for wildlife.

No wading bird colonies were located within the study area. However, the Illinois Natural Heritage Inventory has documented two 1000-2000 nest mixed species colonies in East St. Louis. The nearest of these two colonies is approximately one mile east of the Monsanto plant near the Alton & Southern rail yards in Alorton. The second site is over two miles to the north at Audobon Avenue and 26th Street. These two colonies contain the only breeding little blue heron and snowy egret in Illinois. In addition, black-crowned night heron, great egret, cattle egret (*Bubulcus ibis*), great blue heron (*Ardea herodias*), and green-backed heron (*Butorides virescens*) nest in the colonies.

In 1988, because the region is heavily industrialized with numerous Superfund sites, the U.S. Fish & Wildlife Service (USFWS) collected black-crowned night heron and little blue heron eggs from the Alorton colony for contaminant analysis (Young, 1989 - unpublished draft). Sediment samples were also taken in areas of observed wading bird foraging around the East St. Louis region. No testing was done of sediments in the Dead Creek drainage. PCB's, DDE, and metals were detected at varying levels from the wading bird eggs.

The observed endangered and threatened wading birds forage on a wide range of aquatic organisms such as fish, frogs, and crayfish, as well as some terrestrial species such as reptiles and insects. The USFWS study found that wading birds forage over a wide area around East St. Louis. The Dead Creek/Prairie du Pont wetlands system composes a relatively small percentage of the available wetland foraging area in the region.

Wetlands

Wetlands in the study area consist of riparian woods, shrub swamp, marsh, and wet meadow located adjacent to the area's waterways. Drainage from the Monsanto plant and much of the industrial area at the head of Dead Creek is routed away from the Dead Creek drainage via the local municipal sewer system. Dead Creek begins south of an industrial zone adjacent to the Cerro property and flows slowly south through residential neighborhoods. The stream is bordered by a dense, narrow band of riparian trees and shrubs, including cottonwood, willow, mulberry, and box elder (Photo B-1). Homeowners have cleared to the creek's edge and have established lawn along several sections. Within the residential area (east of Route 3) the stream is crossed, via culverts, by seven roads. At the Judith Lane road crossing, the road culvert has been set approximately one foot higher than the observed water level, apparently

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[1] Also endangered in Missouri.

to allow drainage of the channel only during high-water events. The pooled channel behind this road is connected to a small pond located at the end of Walnut Street where herons, painted turtle, wood duck, fish, and evidence of beaver (chewed trees, see Photo B-2) were observed (see Table B-1).

Downstream of the impounded channel Dead Creek segments C and D flow south through bordering wetlands (Photo B-3, note Green Backed Heron in center of photograph). For a short section, adjacent to Parks College, the creek is routed through a culvert under a parking area. Throughout the rest of the creek's length it is bordered by either riparian vegetation (Photo B-4) or lawn (Photo B-5). Emergent and aquatic vegetation occurs along the creek's shores. Wildlife observed in and adjacent to the stream included herons, turtles, songbirds, squirrel, and raccoon. Small fish and frogs were observed throughout the creek's length.

West of Route 3 the creek flows south and west through the American Bottoms floodplain. This area contains active and abandoned agricultural land divided by levees and railroad right-of-ways. After crossing Route 3 Dead Creek flows under a railroad right-of-way and is joined by a stream draining land from the north. North of the confluence of these two waterways is a road which cuts SE to NW across the floodplain, connecting Cahokia to Fox Terminal. To the north (upstream) of this road is a gas tank farm and fields. The stream was observed to flow south under the Fox Terminal road and into Dead Creek. A second dry culvert was observed west of the stream crossing in the vicinity of the north end of the Dead Creek borrow pond. This culvert appeared to drain the land north of the Fox Terminal road during high-water events when water from the tank farm and surrounding area becomes impounded behind the roadway.

Downstream of the confluence of the two waterways, Dead Creek flows through riparian woods and shrubs and into a borrow pond. The pond appears to have been excavated during the construction of the local levee system. The United States Geological Survey (USGS) map of the area (Cahokia) indicates that the pond was dug to its current shape sometime after 1954. The pond is the largest non-flowing waterbody in the area. Its shore is surrounded with mature riparian trees and emergent wetland vegetation. Ducks, herons, and fish were observed in the pond.

Dead Creek forms the outlet of the pond, draining south through a pump station under the levee (Photo B-6) and into the ditched section of Prairie du Pont Creek[2]. At the confluence and above it (Photo B-7) the ditch shore is vegetated with grasses, herbs, and small shrubs. The channel flows northwest to Arsenal Island on the Mississippi River. Arsenal Island contains areas of mature riparian woods and agricultural fields. The shoreline of the lower end of the ditch (referred to on the USGS map as Cahokia Chute) is lined with riparian

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[2] The actual name of this section of stream is not specified in any maps of the region. SE of Cahokia, Harding Ditch joins Prairie du Pont Creek. The ditch continues west and then northwest around the south side of Cahokia. Sections of Old Prairie du Pont occur south of the ditch. Once the ditch reaches Arsenal Island the USGS map calls the channel Cahokia Chute.

woods, principally large cottonwoods and willow (Photo B-8). Large catfish, wood duck, wading birds, and turtles were observed in the channel. Cahokia Chute forms the eastern border of Arsenal Island. The waterway flows north to south, draining the region northeast of the island. It appears that during times when the Mississippi River is high the River uses the Chute channel to flow around Arsenal Island. Any water from the Dead Creek watershed therefore only flows through the lower half of the Cahokia Chute between the confluence with the ditched Prairie du Pont and the Mississippi River. The remains of the bald eagle nest and congregating wading birds were observed at the southern tip of Arsenal Island, where the Chute flows into the Mississippi.

Almost the entire length of the Dead Creek study area is bordered by wetlands. Most of the wetlands are confined to a narrow riparian strip adjacent to the Creek. More extensive wetlands occur west of Route 3, particularly in the vicinity of the borrow pond. The Creek's wetlands appeared healthy with no evidence of ecological stress (no chlorotic plants, no nonspecific stands of vegetation, no areas of dying or dead vegetation, observable presence of diverse pelagic communities in the stream, no observed surface water sheens or sediment staining). The wetlands also appeared to support a diverse aquatic and terrestrial wildlife community, with abundant prey species (i.e. fish, frogs, turtles) and predatory species (i.e. wading birds, waterfowl, raccoons) present. The wetlands west of Route 3 receive water from both Dead Creek and from drainages to the north, including the area around the gas tank farm.

Conclusion

During the field survey and subsequent contact with state and federal agencies, three categories of HRS-defined sensitive environments were located in the Monsanto/Dead Creek area: Habitat Known to be Used by Federal Designated or Proposed Endangered or Threatened Species, Habitat Known to be Used by State Designated Endangered or Threatened Species, and Wetlands. These three categories are interrelated with the rare species documented all utilizing wetland/waterway habitats. The rare species observed forage over a wide area, with the Dead Creek watershed forming only a small part of their available feeding territory.

The Dead Creek watershed also appears to support a diverse plant and animal community. While much of the Creek flows through residential neighborhoods, sufficient natural riparian vegetation remains to support local aquatic and terrestrial communities. No evidence of ecological stress was evident in the upper Creek near the Monsanto facility, nor anywhere else along the waterway's path to the Mississippi.

List

Individuals Contacted Regarding Ecological Resources

Butch Atwood/William Bertrand
Illinois Dept. of Natural Resources
Boundary Rivers Program
(618) 594-3627

Randall Collins/Terry Campos
Illinois Dept. of Natural Resources
Natural Heritage Inventory
524 South Second Street
Springfield, IL 62701-1787
(217)785-8290

Fred French
U.S. Food and Drug Administration
Marion, IL
(618) 242-9124

Robert Hite
Illinois Environmental Protection Agency
2309 West Main
Marion, IL 62959
(618) 993-7200

James Holsen
St. Louis Audubon Society
419 E. Argonne Drive
Kirkwook, Missouri 63122
(314) 822-0410

Vernon Kleen
Illinois Dept. of Natural Resources (ornithology)
524 South Second Street
Springfield, IL 62701-1787
(217) 785-8290

Decker Major
Illinois Dept. of Natural Resources
Region 4
Alton, IL
(618) 462-1181

Randy Sauer
Illinois Dept. of Natural Resources (fisheries)
201000 Hazlet State Park Road
Carlyle, IL 62231
(618) 594-3627

Robert Williamson
Illinois DNR
(commercial fisheries)
(217) 782-6424

Melanie Young
U.S. Fish & Wildlife
4469 48th Ave. Court
Rock Island, IL 61202
(309) 793-5800

TABLE B - 1
OBSERVED SPECIES OF FISH & WILDLIFE
SAUGET/CAHOKIA, IL
7/29-30/96

Common Name	Scientific Name	Wet Upland Shrubs	Wet/Dry Field	Riparian Woods	Mississippi River	Dead & Prairie du Pont Creeks	Pond	Industrial Area
AMPHIBIANS								
American Toad	Bufo americanus	O	X	X		X	X	X
Gray Treefrog	Hyla versicolor	X		O		X	X	
Pickerel Frog	Rana palustris	X	O	X		X	X	
REPTILES								
Red-eared Slider	Pseudemys scripta				X	O		
Painted Turtle	Chrysemys picta				X	O	O	
BIRDS								
Great Blue Heron	Ardea herodias		X	O	O	O	X	
Great Egret	Casmerodius albus		O		O	O	O	
Snowy Egret	Egretta caerulea				O	O	O	
Little Blue Heron	Egretta thula				O	O	O	
Cattle Egret	Bubulcus ibis		O					
Green-backed Heron	Butorides striatus	O		X	O	O	O	
Black-crowned Night-Heron	Nycticorax nycticorax			X	O	O	X	
Wood Duck	Aix sponsa	X		X	X	O	X	
Mallard	Anas platyrhynchos	X	X	X	X	O	X	
Turkey Vulture	Cathartes aura	X	O	X			X	
Bald Eagle	Haliaeetus leucocephalus			old nest	X	X		
Red-tailed Hawk	Buteo jamaicensis	X	O	O				X
American Kestrel	Falco sparverius	O	O					O
Nothern Bobwhite	Colinus virginianus	O	X					
Killdeer	Charadrius vociferus		O					X
Rock Dove	Columba livia		X					O
Mourning Dove	Zenaida macroura	O	O	O				O
Yellow-billed Cuckoo	Coccyzus americanus	O		O				
Chimney Swift	Chaetura pelagica	O	X	X	X	O	O	O
Belted Kingfisher	Ceryle alcyon				O	O	O	

Common Name	Scientific Name	Wet Upland Shrubs	Wet/Dry Field	Riparian Woods	Mississippi River	Dead & Prairie du Pont Creeks	Pond	Industrial Area
Red-headed Woodpecker	Melanerpes erythrocephalus			O				
Downy Woodpecker	Picoides pubescens	O		O				
Eastern Phoebe	Sayornis phoebe	X		O	X	O	X	X
Eastern Kingbird	Tyrannus tyrannus	O	O		X	X	X	X
Tree Swallow	Tachycineta bicolor	X	O	X	X	O	X	X
Bank Swallow	Riparia riparia	X	O	X	X	X	X	X
Cliff Swallow	Hirundo pyrrhonota	X	O	X	X	X	X	X
Barn Swallow	Hirundo rustica	X	O	X	X	O	O	O
Blue Jay	Cyanocitta cristata	X		O				
American Crow	Corvus brachyrhynchos	X	O	O				X
Carolina Chickadee	Parus carolinensis	X		O				
Tufted Titmouse	Parus bicolor			O				
White-breasted Nuthatch	Sitta carolinensis			O				
Brown Creeper	Certhia americana			O				
Carolina Wren	Thryothorus ludovicianus	O		X				
House Wren	Troglodytes aedon	O		O				
American Robin	Turdus migratorius	O	O	O				X
Gray Catbird	Dumetella carolinensis	O		O				
Nothern Mockingbird	Mimus polyglottos	X	X					O
Cedar Waxwing	Bombycilla cedrorum	O		O				
European Starling	Sturnus vulgaris	X	O	O				O
Common Yellowthroat	Geothylpis trichas	O		X				
Northern Cardinal	Cardinalis cardinalis	O		O				
Indigo Bunting	Passerina cyanea	O		O				
Song Sparrow	Melospiza melodia	O	O	X				X
Red-winged Blackbird	Agelaius phoeniceus	O	O	O		O	O	
Common Grackle	Quiscalus quiscula	O	X	O				
Northern Oriole	Icterus galbula			O				
American Goldfinch	Carduelis tristis	O	O	O				
House Sparrow	Passer domesticus		X					O
MAMMALS								
Gray Squirrel	Sciurus carolinensis	O		O				
Fox Squirrel	Sciurus niger			O				
Beaver	Castor canadensis			O	O	O	O	
Raccoon	Procyon lotor	O	X	O	O	O	O	X
White-tailed Deer	Odocoileus virginianus	O	O	O		O		

Common Name	Scientific Name	Wet Upland Shrubs	Wet/Dry Field	Riparian Woods	Mississippi River	Dead & Prairie du Pont Creeks	Pond	Industrial Area
FISH*								
Bowfin	Amia calva					SO		
Gizzard Shad	Dorosoma cepedianum					SO		
Grass Pickeral	Esox americanus					SO		
Common Stoneroller	Campostoma anomalum					SO		
Goldfish	Carassius auratus					SO		
Carp	Cyprinus carpio					SO		
Golden Shiner	Notemigonus crysoleucas					SO		
Bigmouth Shiner	Notropis dorsalis					SO		
Red Shiner						SO		
Sand Shiner	Notropis stramineus					SO		
Fathead Minnow	Pimephales promelas					SO		
Creek Chub	Semotilus atromaculatus					SO		
White Sucker	Catastomus commersoni					SO		
Bigmouth Buffalo	Ictiobus cyprinellus					SO		
Black Bullhead	Ictalurus melas					SO		
Yellow Bullhead	Ictalurus natalis					SO		
Channel Catfish	Ictalurus punctatus					O & SO		
Mosquitofish	Gambusia affinis					SO		
Green Sunfish	Lepomis cyanellus					SO		
Warmouth	Lepomis gulosus					SO		
Orangespotted Sunfish						SO		
Bluegill	Lepomis macrochirus					SO		
Largemouth Bass	Micropterus salmoides					SO		
Black Crappie	Pomoxis nigromaculatus					SO		
Freshwater Drum	Aplodinotus grunniens					SO		
Small unidentified fish					O	O		

X - Species Probably Utilizes Habitat O - Species Observed in the Habitat
SO - Species Observed in the Prairie du Pont drainage during 1984 State Stream Survey

* From Atwood, E.R., 1992. Assessment of Fisheries Quality of Streams in the American Bottoms Basin, IL Dept. of Conservation, 48 pp.

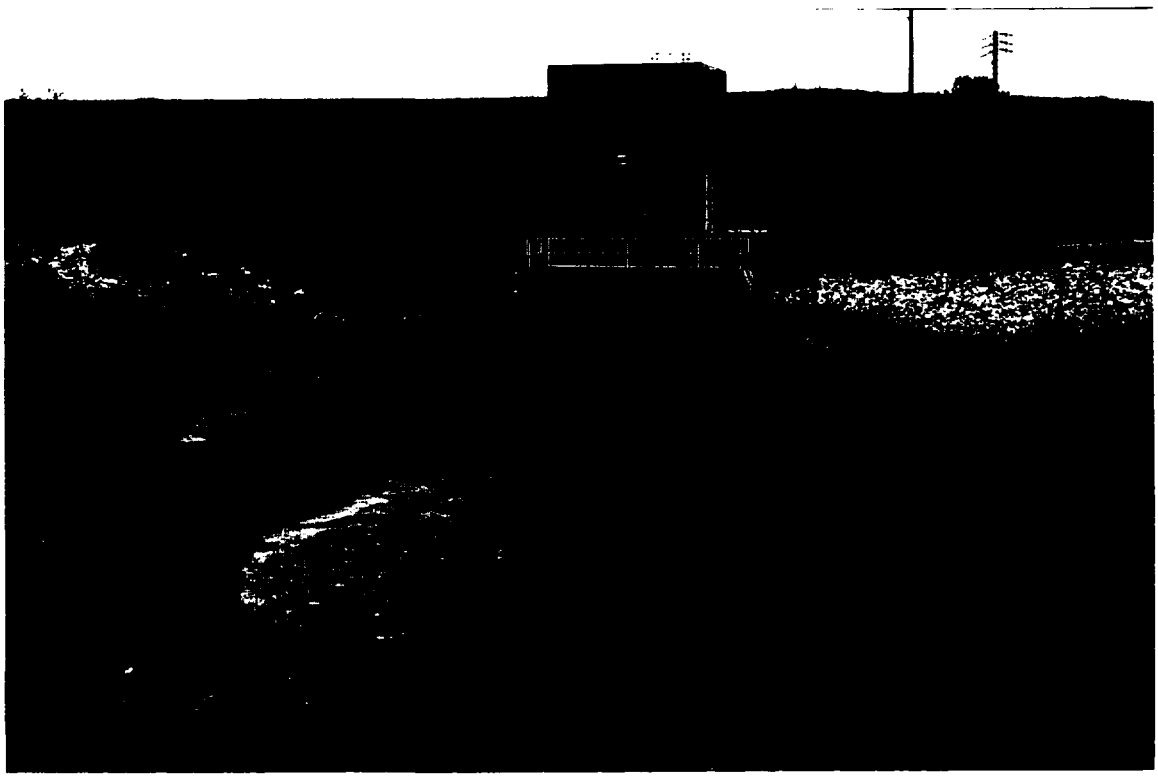
B-1 Creek Segment B from Judith Lane, Source 8 to right.

B-2 End of Walnut Street, Source 8, downed tree in "pond," fence down, note beaver marks.

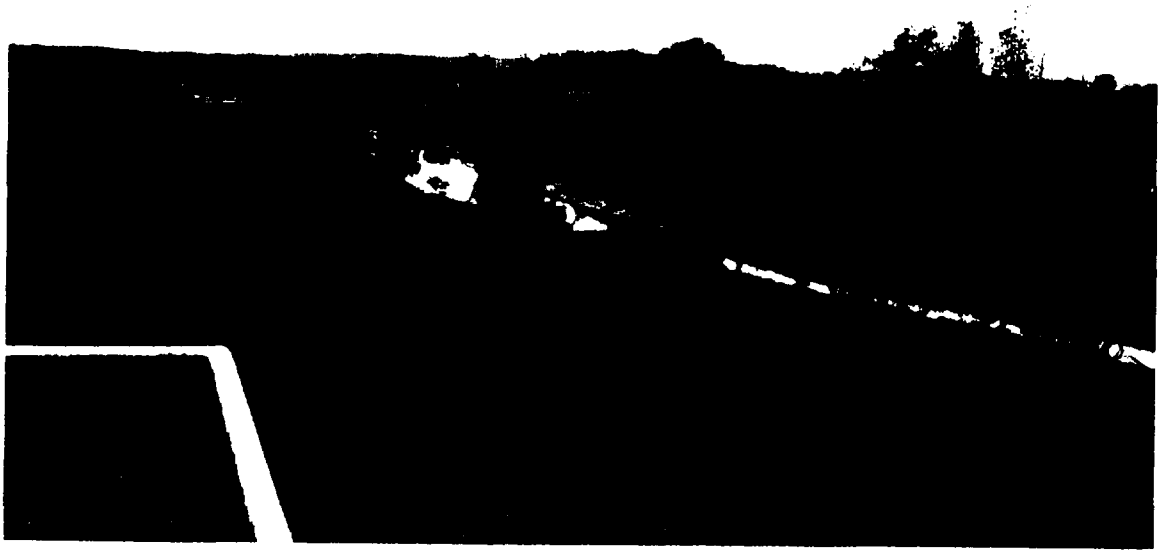
B-3 Looking south into Dead Creek Segment C from Judith Lane, with Green Backed Heron

B-4 Dead Creek Segment E from White (?) Street.

B-5 Dead Creek in Cahokia, north from White (?) Street.



B-6 Pump station from road.



B-7 Old Prairie du Pont Creek, upstream from confluence with Dead Creek.

B-8 Cahokia Chute, south arm.